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Developing a Guidance and Counseling Dashboard Using Cross-Contextual Log Data for MTSS

Junya ATAKE[a*], Chia-yu HSU[b], Izumi HORIKOSHI[c], Hiroaki OGATA[b]
[a] *Graduate School of Informatics, Kyoto University, Japan*
[b] *Academic Center for Computing and Media Studies, Kyoto University, Japan*
[c] *Uchidayoko Institute for Education Research, Japan*
*atake.junya.86t@st.kyoto-u.ac.jp

Abstract: This study aimed to explore the potential of a Guidance and Counseling Dashboard (GCD) that visualizes cross-contextual log data for supporting guidance and counseling (G&C) based on multi-tiered systems of support (MTSS) framework. In response to the increasingly diverse needs of learners, MTSS has been adopted as an essential framework for providing timely and equitable support. The GCD supports the practice based on this model and consists of the Classroom View Module and the Individual View Module. A preliminary evaluation of the GCD was conducted through semi-structured interviews with five junior high school teachers in Japan. The results showed that the GCD effectively supported teachers in identifying learners' strengths and challenges, fostering communication, and interpreting and utilizing log data. Teachers rated the dashboard highly across the evaluation criteria, and feedback highlighted the usefulness of MTSS-based visualizations and customized feedback. Future research should focus on developing recording teachers' assist logs and feedback generation using generative AI to enhance data-informed decision-making and intervention strategies in G&C.

Keywords: Guidance and Counseling, Dashboard, Learning Analytics, MTSS

1. Background and Foundation

Guidance and Counseling(G&C) is crucial for creating a favorable learning environment and promoting learners' holistic and comprehensive development (Naraswari 2024; MEXT 2022). To effectively address the increasingly diverse and complex needs of learners, a model known as the Multi-Tiered System of Supports (MTSS), which consists of three tiers—universal support for all learners (Tier 1), targeted interventions for those at risk (Tier 2), and intensive, individualized support for learners with significant needs (Tier 3), has been adopted as an essential framework. This model enables effective, data-driven support across three domains—academic, behavioral, and social-emotional—ranging from universal interventions to individualized support for complex challenges (Ito et al., 2023; Nitz et al., 2023). With the spread of ICT tools, data related to learners' learning and lives are being accumulated, and it is expected to be integrated with other data sources to improve the "Understanding of learners" and enhance G&C strategies (MEXT, 2022). Atake et al. (2024) extracted characteristics from log data, such as "Stress level is good status" and "math score is a crisis". This supports teachers in "Understanding of learners" and capturing potential changes in interest and status (Atake et al.,2024). However, the implementation of MTSS-based guidance and counseling using log data, along with the development of data management and visualization tools to support data-driven decision-making, has not been explored, mainly because teachers who are not directly involved often struggle to interpret cross-contextual data without sufficient contextual understanding, making such tools less likely to be considered.

To address this issue, we developed a Guidance and Counseling Dashboard (GCD) using normalized cross-context learning logs from our previous study and demonstrated their effectiveness as characteristics for G&C, so that homeroom teachers who are not subject-

specific can use them. The dashboard includes two main modules: the Classroom View Module, which supports capturing activity trends in the class and identifying learners' needs, and the Individual View Module, which supports understanding of each learner's status and identifying specific areas where targeted learners need support. The following research questions were addressed.

- RQ1: Can teachers effectively identify support priorities and needs using the Classroom View Module that integrates log data?
- RQ2: What potentials do teachers identify from Individual View Module for providing Guidance and Counseling practice?

2. Guidance and Counseling Dashboard

Figure 1 shows the Classroom View Module and Individual View Module of the proposed Guidance and Counseling Dashboard (GCD). The following subsections illustrate the design of the modules along with the scenarios according to the general process of G&C and the data gathered from actual student learning activities and health observations, covering one week in December 2024 in a Japanese junior high school. Learning scores were calculated based on specific characteristics (Atake et al., 2024), and data on health, emotional state, and sleep duration, entered by students during the period, were also available.

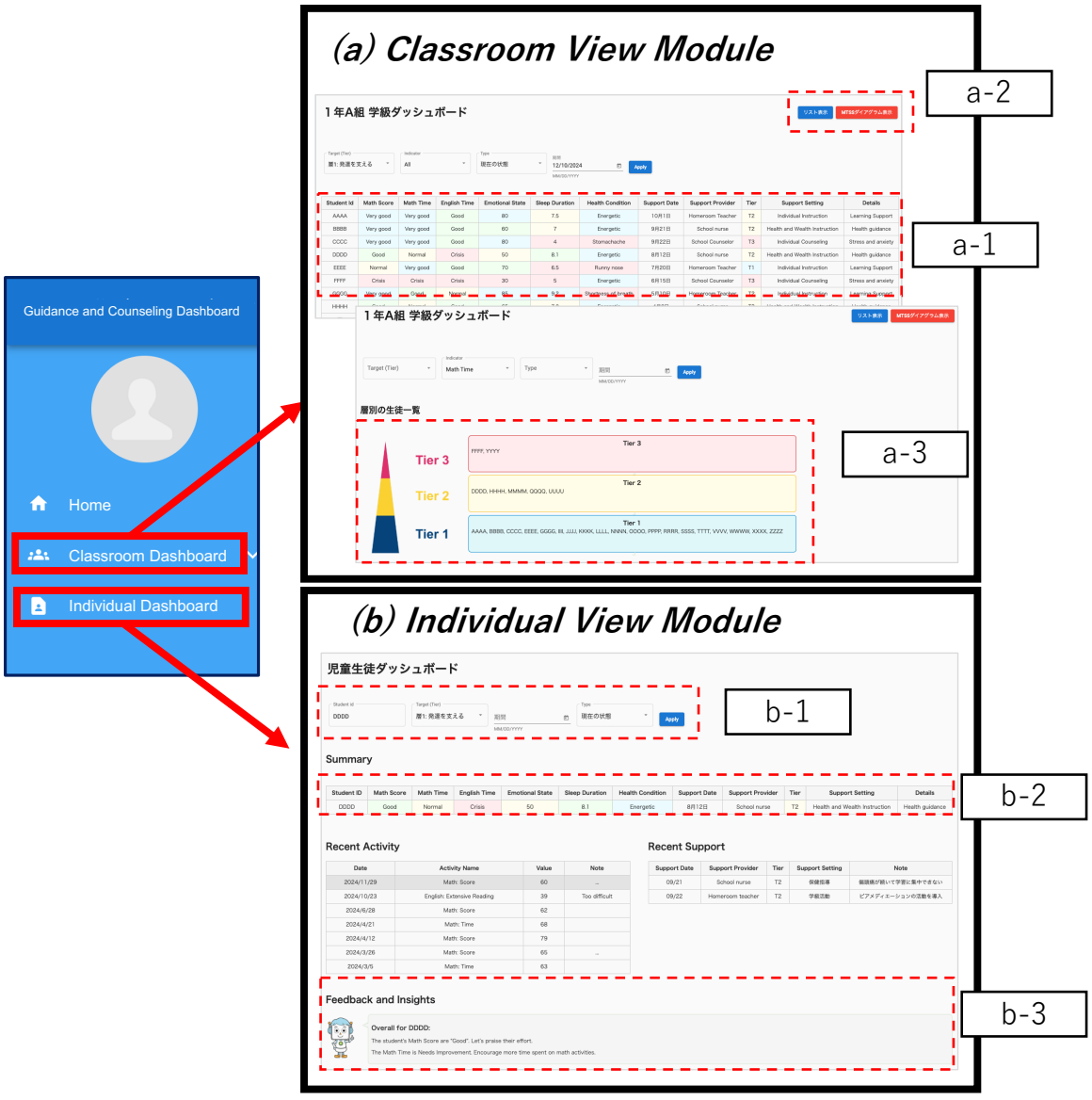

Figure 1. Main Modules of the System

2.1 Classroom View Module

The Classroom View Module is described in Figure 1 (a). This module supports "Understanding of learners" in the G&C process. The scenarios were as follows: The teacher has an individual meeting tomorrow and prepares for it by reviewing learners' health and lifestyle data on the classroom dashboard, focusing on concerns raised by parents about disrupted daily routines due to late-night studying. Teachers were expected to operate the dashboard to check learners' conditions in line with the scenarios provided. First, they select relevant indicators from the dashboard, such as sleep duration, physical activity, and stress levels, which are associated with the concerns raised during the previous parent-teacher conference. Next, the teacher sets the time range to cover the most recent weeks to observe current trends and changes in these indicators. By using the list view (Figure 1 (a-1)), they select Tier 2 to focus on students whose statuses are categorized as "Normal" or "Crisis." This enables the teacher to narrow down and prioritize learners experiencing disruptions in their daily routines. The heatmap visualization in the list view helps the teacher quickly identify students with higher risk levels through color coding. If necessary, the teacher switches (Figure 1 (a-2)) to the diagram view (Figure 1 (a-3)) to examine specific indicators in more detail, mapping learners by tier to gain a clearer visual representation of which students fall under each tier. Through this process, the teacher utilizes the Classroom View Module not only to confirm their general impressions but also to support data-informed decision-making about which students may require closer attention or follow-up during the upcoming individual meetings.

2.2 Individual View Module

The Individual View Module is shown in Figure 1 (b). The following scenarios were used: After receiving a report about an incident involving Student D during the math lesson on the first day back from winter break, the homeroom teacher (participant) reviews the student's recent behavioral and emotional status before providing guidance or discipline. The teacher accesses the Individual View Module, selecting Student D from the class list.

According to this scenario, the teacher enters the student's name and then selects the tier to focus on as in the Classroom View module (Figure 1. b-1). Values are then displayed in a list view for the filtered indicators, Tier, and period (Figure 1. b-2). One of the main functions of the Individual View module is the feedback function. According to the selected learners and indicators, feedback will be provided using the following logic. (1) Evaluation for each indicator, (2) Positive and Negative Feedback Generation, (3) Feedback Priority, (4) Customized feedback content. This feedback function allows the teacher to objectively assess the learner's current situation and provide appropriate support and intervention according to the individual situation (Figure 1. b-3). Feedback results can also guide teachers in recording their interactions with and support for learners."

3. Preliminary Evaluation

To answer the research questions, we conducted semi-structured interviews with five teachers and explored the effectiveness of the dashboard. The teachers are from the Japanese junior high school, who are the director of G&C (T1), an assistant guidance counselor (T2), and three homeroom teachers (T3, T4, and T5). The following steps were taken in the interview:
(1) Introduce the main interface and functions of the dashboard.
(2) Ask teachers to operate the dashboards based on the scenarios introduced in Section 2.
(3) Ask teachers to evaluate the effectiveness of the dashboard based on evaluation criteria.
(4) Interview the current design and display.

Each module and the two display types, list view and multi-tiered diagram view in the classroom module, were evaluated. Evaluation criteria (EC), developed with reference to the perspective of understanding of learners by MEXT (2022), were rated on a 5-point Likert scale, followed by the interview questions (IQ) below (Table 1). As for the analysis of the IQ, we primarily focused on extracting common responses among the teachers.

Table 1 Evaluation Criteria (EC) and Interview Questions (IQ)

Items	Contents
EC1	Visualizations help identify students' efforts and strengths.
EC2	Visualizations help understand students' challenges and difficulties.
EC3	The dashboard is useful for initiating communication with students.
EC4	The dashboard supports a deeper understanding of students.
EC5	Visualizations clarify the meaning of log data, even for non-subject teachers.
EC6	Visualizations highlight the value of using log data, even for non-subject teachers.
EC7	The list view helps quickly grasp diverse indicators.
EC8	The multi-tiered diagram is easier than the list view for identifying specific needs.
IQ1	Can you briefly explain the reasons for each evaluation?
IQ2	What aspects did you focus on while using the tool?
IQ3	Are there any areas for improvement in the visualization tool?

4. Results

4.1 RQ1. Identification of Support Priorities and Needs for Guidance and Counseling

Teachers rated the Classroom View Module as highly effective in helping identify learners' support needs, as indicated by the EC results. The average scores for the eight evaluation items ranged from 3.8 to 4.4 (out of 5), with standard deviations between 0 and 0.83, indicating generally high and consistent evaluations. Interview responses revealed that the list view was useful for identifying classroom trends and diverse indicators briefly, while the multi-tiered diagram view enabled earlier identification of at-risk learners by clearly mapping them to specific tiers. Additionally, the visual design (e.g., heatmaps, color coding, diagram view) was appreciated for its clarity and ease of interpretation, even by teachers unfamiliar with the specific contexts from which log data originated. These results were supported by interviews (Table 2), where two or more teachers noted the clarity and ease of interpretation of the visual design and diagram displays (IQ1), and the intuitive presentation helped teachers focus on individual student efforts and identify issues for information sharing and positive feedback (IQ1 and 2). In summary, the classroom view module of the GCD integrated log data is useful for effectively identifying support priorities and needs.

Table 2 Interview Responses Corresponding to Research Question 1

Interview Question	Common answers noted by two or more teachers
IQ1	・Useful for identifying issues and sharing information.(T1, T2, T4) ・Easy-to-read design (e.g., diagram display, centralized information). (T3, T5)
IQ2	・Identifying students of concern (highlighted in red items). (T1, T2, T4) ・Monitoring emotional balance and health observations. (T2, T4, T5)

4.2 RQ2: Insights from Individual Dashboard to Apply to Guidance and Counseling

Evaluation scores for the Individual View Module across six criteria ranged from 3.8 to 4.6 (out of 5), with standard deviations between 0.44 and 0.70, indicating generally positive and consistent evaluations. Interview responses highlighted that the module was useful for focusing on individual student efforts and the ability to find opportunities to praise students based on data. T2 and T4 noted its utility in offering customized feedback generated based on selected indicators and tiers, recent activity logs that include learner inputs and learning

logs within the digital learning environment. These features were seen as facilitating data-driven decision-making and enabling teachers to tailor support more effectively. T2, T4, and T5 also emphasized the potential of this module to foster communication with learners and their parents by presenting clear and objective evidence of learner status and progress. From this, the answer to RQ2 is that the integrated log data on the dashboard enables teachers to understand their efforts and provide positive support and intervention in G&C practice.

5. Discussion and Conclusion

This study explored the potential of the Guidance and Counseling Dashboard that integrates normalized cross-contextual learning logs from our previous study (Atake et al., 2024) for supporting guidance and counseling (G&C) based on multi-tiered systems of support (MTSS) framework. The results showed that the GCD effectively supported teachers in identifying learners' strengths and challenges, fostering communication, and interpreting and utilizing log data. Although the sample size was small and the validity and reliability of the evaluation criteria were not fully examined, teachers' evaluation was largely consistent with the dashboard's design intent to support teachers' G&C, demonstrating its effectiveness. This study contributes to the existing literature by extending previous findings on the effectiveness of data visualization tools in MTSS (Saia, 2023), demonstrating that dashboards integrating cross-contextual log data can support practical communication between teachers and learners or their parents and individualized guidance.

There are two directions for future research. First, relying only on cross-context log data has limitations. A principle of MTSS is synthesizing multiple data sources to identify learners' needs, and log data should serve as a trigger for this synthesis. It is essential to capture various data at the same time, and this is effective in terms of not overlooking important factors in MTSS. The next point is implementation and conducting experiments in the actual G&C setting. We aim to support the Understanding of learners, strategic support for interventions in the real context, and further analysis through the accumulation of assist logs. In addition, analysis of them can lead to significant advancements in evidence-based G&C practices. Furthermore, the generation of actionable feedback, potentially enhanced using Generative Artificial Intelligence (GenAI), can support teachers in making informed decisions and improving their strategies for learner support.

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