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How Expertise Levels Shape Preferences and Reflection Needs: Towards AI Reflection Systems for Teacher Empowerment

Ann-Christin Falhs[1[0000-0002-2339-6285]], Conrad Borchers[2[0000-0003-3437-8979]], Vanessa Echeverria[3,4[0000-0002-2022-9588]], Kexin Yang[2[0000-0002-8132-0166]], Nikol Rummel[1,2[0000-0002-3187-5534]], Vincent Aleven[2[0000-0002-1581-6657]]

[1] Ruhr University Bochum and
Center for Advanced Internet Studies, Bochum, Germany;
[2] Carnegie Mellon University, Pittsburgh, USA;
[3] RMIT University, Melbourne, Australia;
[4] Escuela Superior Politécnica del Litoral, Guayaquil, Ecuador;
ann-christin.falhs@rub.de

Abstract. The increasing use of AI systems opens up opportunities to use learner and teacher-related data for reflection, supporting instruction and professional growth. However, teacher-related data is rarely collected in technology-enhanced learning environments. Understanding teacher preferences can inform the design of AI reflection systems that align with their priorities. The current survey study explores how K-12 teachers' reflection practices and preferences for analytic data types (e.g., learning-related vs. engagement-related) vary by experience, an aspect often overlooked in prior works. Findings from our survey study with N=100 teachers in the U.S. revealed significant differences. Less experienced teachers focus on classroom behavior and prefer analytics on classroom issues, while experienced teachers prefer broader strategies to improve student learning and favor sustained data analysis. Our results reflect the need to consider teachers' experience level by tuning the complexity and concreteness of analytic recommendations to support ongoing professionalization.

Keywords: Human-AI-Augmentation, Classroom Analytics, Reflection

1 Introduction

Effective teaching hinges on reflecting on past practices, understanding their impact and adapting strategies to improve [1]. We define teacher reflection, referring to Schön [18], as a 'reflection-on-action' process analyzing one's actions after they have occurred, to learn from experience and improve future practice. Recent research in learning analytics (LA) and AI offers new opportunities for enhancing reflection by providing real-time, data-driven insights. AI reflection systems allow teachers to analyze the effectiveness of their teaching and improve their practices [e.g., 19], for example by having access to data-driven evidence of their pedagogical strategies [2].

However, technology-enhanced learning environments that fuel these AI reflection systems typically collect students' data through traces and interaction logs [e.g., 12, 10, 15] but rarely capture data about teachers [11]. Thus, little is known about the affordances and requirements of teacher-centered reflection systems. Combining teacher and student data offers a synergistic approach to support teachers in generating novel insights for self-reflection [13]. As a first step in a broader design process, we explore teachers' preferences and concerns regarding different types of data and analytics for developing AI reflection systems that integrate fine-grained teacher and student data.

To move the field closer to AI reflection systems that center around teacher data and practices, it is critical to align data and analytics with specific teaching goals. Emerging research is exploring how analytics can support pedagogical interventions and classroom orchestration [7], emphasizing the importance of teacher-centered design and the need to understand teacher practices to tailor AI systems effectively [21].

In addition to considering general teacher needs, experience, and attitudes also influence their challenges and practices [9]. Teachers at different career stages vary in their professional knowledge [3], which may have implications for systems' design. However, such systems are often designed using a "one-size-fits-all" approach that overlooks the diverse needs and experiences of teachers. The present study addresses this gap by comparing analytics needs across different levels of teaching experience.

Although an increasing number of teacher-facing analytics systems are being developed [e.g., 2, 12], most are not explicitly designed to support teachers' reflection or account for individual differences, such as teaching experience, preferences or needs. Only a few studies have adopted a needs-centered approach. For instance, Colling et al. [6] evaluated the perceived usefulness of dashboard features and incorporated the most requested ones. Fütterer et al. [9] proposed professional development courses tailored to teachers' prior knowledge and interests, while Saar et al. [17] reported design principles for personalized classroom data-collection systems, highlighting the importance of including teachers' needs depending on their level of experience.

In our research, we focus on AI systems to support teacher reflections based on teacher and student data. Specifically, we explore the following research questions:
RQ1: Do teachers' motivations and obstacles to reflection differ by experience?
RQ2: How do teachers' preferences for teacher and student data and analytics differ by experience?

2 Methods

We surveyed teachers' motivations and obstacles to reflection, as well as their preferences for teacher and student data and analytics, and analyzed them by grouping teachers based on experience level. The goal was to derive design insights about how AI-driven teacher reflection systems may or may not need to be adapted to different experience levels to unfold their full effectiveness in practice.

2.1 Sample

The survey included 100 teachers (64 females, 35 males, 1 non-binary) recruited by Prolific and administered online using Qualtrics. Eligibility criteria included: U.S. location, English as primary language, prior teaching experience, and teaching in primary, middle, or high school. Participants ranged in age from 20 to 62 years (M=38.15, SD=11.11) and varied in levels of experience, with 57 teachers having over 8 years of experience, 6 having 7-8 years, 12 having 5-6 years, 13 having 3-4 years, and 12 having less than 3 years of experience. Teachers taught a variety of subjects (multiple answers allowed), including language (47), math (34), science (30), and other subjects (21) such as art and music. Ethical approval was obtained for the study.

2.2 Survey and Procedure

The survey design was informed by prior works on reflection practices, teacher development, and classroom data usage [e.g., 14, 16, 17]. It contained multiple-choice questions and ranking items. For RQ1, we examined motivations (reasons and obstacles) for reflection. For RQ2, we explored preferences for teacher and student data and analytics. In both questions, we used a top-three ranking method. The survey, estimated to take 40 minutes to complete, comprised an introduction, online consent form, demographic items in addition to the items about teachers' reflection practices pertaining to our research questions. Participants provided informed consent before participating in the survey (between July and August 2023) and received monetary compensation for their participation.

2.3 Data Analysis

We analyzed quantitative data using differential analyses to identify differences in reflection practices, motivations, analytics, and data-sharing preferences considering teachers' years of experience. A median split at nine years (according to [4]) was used to define two groups (less vs. more experienced). Survey responses were cleaned and processed to extract teachers' top three choices. Binomial tests were used to compare group differences and reveal patterns concerning the frequency of the chosen preferences for motivators, obstacles, and analytics preferences influenced by experience levels. Binomial tests were chosen for their statistical power, as detecting differences in the likelihood of selecting specific options is more robust than comparing ranks. An ad-hoc power analysis based on Wickelmaier [22] confirmed that our sample of 100 teachers was sufficient to detect a minimally relevant effect size of 15% difference in choice behavior with a sufficient statistical power of about 83%.

3 Results

RQ1: Based on their top three choices, teachers reported different motivations and obstacles to reflection. Time constraints and scheduling conflicts were the most common

obstacles, while improvement-oriented goals were key motivators. Although teachers value reflection, they rarely find the time. Significant differences emerged based on teaching experience. Less experienced teachers more frequently cited the lack of time for reflection as a key obstacle ($p<.001$), with 37% identifying it as a top concern compared to 12% of more experienced teachers. In contrast, more experienced teachers more often reported difficulties in tracking student performance ($p=.009$; 28% of more experienced compared vs. 15% of less experienced teachers). Informal feedback ($p=.025$) was a significantly more common reason among more experienced teachers (45%) compared to less experienced ones (31%). Conversely, less experienced teachers referred to formal feedback more frequently (15%) compared to 26% of more experienced teachers, though this difference was only marginally significant ($p=.055$). All other differences were not statistically significant ($p>.050$).

RQ2: Teachers' preferences for teacher and student data and analytics varied by experience level. More experienced teachers were significantly more likely to prioritize analytics on improved learning after helping a student (40%), compared to 26% of less experienced teachers ($p=.019$). In contrast, 48% of less experienced teachers were more likely to focus on student disengagement, compared to 33% of more experienced teachers ($p=.028$). Additionally, less experienced teachers showed greater interest in analytics about students' emotions (31%), compared to 18% of more experienced teachers ($p=.036$). More experienced teachers were significantly more likely to be interested in analytics of their teaching methods and classroom practices (42%), compared to 26% of less experienced teachers ($p=.012$). No other differences were statistically significant. Still, some other analytic preferences showed trends. For instance, more experienced teachers more often preferred data on student learning and progress (63%) compared to 52% of less experienced teachers ($p=0.094$), while less experienced teachers more often valued feedback on their teaching (48%) compared to 37% of more experienced ones ($p=0.094$). These findings suggest that teachers with more experience prioritize analytics related to teaching effectiveness and improved learning, while less experienced teachers focus more on student disengagement and emotions.

4 Discussion

Reflection is crucial for teaching, yet teachers often face obstacles to reflecting on their practice. While analytics can offer targeted insights to support reflection, prior research has focused on student data, overlooking teacher data and individual differences. Although based on self-report measures, this study serves as a formative step in a broader user-centered design process to develop teacher-focused AI reflection systems.

RQ1: While teachers are motivated to improve and view reflection as valuable, they expressed time constraints and scheduling conflicts as major obstacles. Technology-based solutions could help by automatically monitoring classroom events and providing actionable insights, offering systematic access to evidence-based reflection opportunities while saving time. We conjecture that, without access to student performance data, teachers may struggle to identify areas for instructional improvement and assess the impact of prior teaching adjustments. Our results align with research showing that

novice teachers often lack routines and skills for applying didactic knowledge into practice [4], which may contribute to their perception of lacking time for reflection.

RQ2: Less experienced teachers tend to focus on student disengagement and emotions, preferring immediate, straightforward analytics to address specific classroom issues. Learning analytics on engagement and affect could help novice teachers better monitor and respond to students' needs [20]. AI systems could track teachers' and students' patterns, provide trend analyses and offer adaptive feedback or AI-driven intervention suggestions. Aggregated data across teachers and students could establish a baseline for different levels of experience, enabling teachers to compare their practice with broader patterns and standards, helping them recalibrate their practices. Less experienced teachers may benefit from structured guidance, such as data-driven prompts and reflection questions [8], while experienced teachers tend to prioritize longitudinal data on student learning and progress over time and impact on teaching. They may prefer flexible, in-depth analysis that supports their broader reflective goals. Nevertheless, designing systems that adapt to, or are adaptable to, different needs poses challenges and AI literacy is required to use analytics effectively. Our findings align with prior research showing that experts are better at selecting relevant information, interpreting observations deeply, and drawing meaningful conclusions [5, 23]. In contrast, novices tend to focus on details of classroom interaction [5] but may miss critical cues or struggle to interpret them meaningfully within the context of the classroom situation [23].

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