Title: Classroom perception: How professional experience influences teachers’ visual processing of problematic classroom management scenes

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Abstract:
Teachers’ visual expertise is a crucial component of their professional skill set, particularly the ability to simultaneously decipher students’ behavior, engagement, and understanding while teaching. This ability to simultaneously monitor and manage the classroom is a complex skill that develops through experience. Combining eye tracking measurements and think-aloud verbalizations, we investigated differences in how expert and novice teachers perceive and interpret problematic classroom scenes. Sixty-seven teachers participated: 35 experienced secondary school teachers (experts) and 32 teachers-in-training (novices). As participants viewed videos of authentic lessons their eye movements were recorded while they verbalized their thoughts about the lesson. Two different types of videos were used for this purpose: lesson fragments showing (1) disengaged, unrelated student behavior and (2) conspicuous disruptions affecting the class. Analysis of eye movements showed that novices’ viewing strategies were more dispersed whereas experts’ were more focused. Irrespective of the video type, experienced teachers were able to focus their attention on areas where relevant information was available, while inexperienced teachers’ attention was scattered across the classroom. Experts repeatedly searched for classroom cues by looking at students’ posture and at interactions between students whereas novices looked more at students’ faces and at students they considered the source of management problems. Experts attended to how students and the teacher affected other students in the class, but novices mainly attended to particular students’ misbehavior and did not attend to its effect on others in the class. These findings provide further insight into teachers’ professional vision, identify useful cues for interpreting classroom interactions, and offer guidelines for training and improving teachers’ visual expertise.

Introduction/Aims
Classroom perception is a crucial skill for effective teaching, integrating keen visual perception in the classroom with proficient knowledge of the classroom. The ‘professional vision’ of teachers – their ability to search for, observe, and make sense of classroom information – transforms over time as they gain experience in the practices of their profession (Goodwin, 1994). How teachers perceive and interpret the complexity of classroom events, particularly student interactions, represents important practical knowledge for the teaching profession.

Visual expertise has been extensively investigated in numerous professions, but research on teachers’ vision is scarce (Reingold & Sheridan, 2011). While we know that experienced teachers develop valuable classroom knowledge about students and events to discern, predict, and manage classroom complexity, we know little about how teachers visually perceive and integrate experiential knowledge (Carter, Cushing, Sabers, Stein, & Berliner, 1988). Understanding
developmental differences in how teachers recognize perceptual cues is similarly limited (van den Bogert, van Bruggen, Kostons, & Jochems, 2014).

Our study aimed to investigate how classroom expertise influences teachers’ visual perception and viewing strategies. The main research question was: *How do experts and novice teachers differ in their visual perception of the classroom?*

We specifically addressed the following research questions:
1. Do expert and novice teachers focus their attention differently in the classroom?
2. Which areas of the classroom do experts and novices fixate on the longest in the classroom?
3. Where do experts and novices look most often in the classroom?
4. Which areas do expert and novice teachers overlook in the classroom?

**Methods**

Our study investigated teachers’ professional vision, concentrating on teachers’ visual processing of problematic classroom management videos. Sixty-seven teacher volunteers ($M=35.5$, $SD=16.3$; 26 females and 41 males) from diverse subject domains participated: 37 experienced Dutch secondary school teachers qualified as experts ($M=49.2$, $SD=10.3$) and 35 teachers-in-training from a Dutch teacher training program were considered novices ($M=20.6$, $SD=2.3$). Experts had 10-35 years of teaching experience, were recognized by peers as excellent classroom managers, and were recommended by school administrators as experts in the classroom. Novices were classified based on their inexperience with classroom teaching and were in either their first or second year of teacher training.

To capture teachers’ cognitive processing, we collected eye tracking data and verbal data. Eye tracking allows measurement and analysis of eye activity, providing an objective measure of visual processing. Eye movements are measured and analysed in relation to where they occur, making it possible to interpret where a person’s gaze (fixations) and attention is directed, gaze duration, and the order in which gazes and attention are allocated. Verbalizations supplemented eye tracking data, clarifying who and what teachers considered relevant to classroom management. Eye movements conveyed visual perception while verbalizations conveyed teachers’ interpretations of what they perceived.

Videos of classroom lessons were used to determine how teachers with different expertise levels attended to relevant information (Seidel, Stürmer, Blomberg, Kobarg, & Schwindt, 2011). Two types of videos were shown. Four short video fragments showed either (1) disengaged but unrelated off-task student behavior, or (2) conspicuous student disruptions affecting many students in the class. To compare expertise effects on the perceptual and interpretive processing, eye tracking measurements and think-aloud verbalizations were recorded simultaneously as teachers viewed classroom videos (Van Gog, Paas, & Van Merriënboer, 2005). Participants were asked to imagine themselves as teachers in these lessons and to express any thoughts they considered relevant to classroom management. To replicate time constraints of real-world classroom monitoring, the videos were played at normal speed and participants were unable to stop the videos during the experiment.

We statistically analyzed fixation dispersion averages to determine significant between-group differences between experts and novices attentional focus. Then we calculated confidence intervals for 64 areas-of-interest mapped across the video stimuli to compare group differences in fixation dwell times, fixation revisits, and skipped areas.

**Results**
Mixed-design ANOVA analyses showed significant expertise differences for fixation dispersion averages, $F(1, 66) = 7.03, p = .01, \eta^2 = .10$, indicating that experts and novices do focus their attention differently. Novices’ viewing strategies were more dispersed, whereas experts’ were more focused. Irrespective of video type, experienced teachers searched for perceptual information in a focused way, while inexperienced teachers’ attention was scattered irregularly across the classroom. Confidence intervals of 99% were used to compare fixation times, fixation revisits, and overlooked areas. Here, too, classroom expertise was found to influence viewing. Experts looked longer at more areas across the classroom and typically overlooked areas where no student activity was occurring, whereas novices spent less time viewing high-activity areas and overlooked areas repeatedly viewed by experts. Experts perceived classroom cues by looking at students’ posture, hands, body movements, and between-student interactions. Novices perceived students’ faces, dwelling on students construed as sources of management problems without attending to the effects of behavioral disturbances on the class as a whole.

**Educational Significance**

Existing theories about classroom processing require support because empirical inquiry into the internal structuring of teachers practical knowledge still has a long way to go (Bromme, 2001). Explicating the relationship between teachers knowledge and the actual practice of teaching, including essential components of effective classroom management, is still a work in progress (van Tartwijk, den Brok, Veldman, & Wubbels, 2009). Our analysis suggests that teachers’ perceptions transform as they gain classroom experience. Experience influences how teachers search the classroom for management cues, especially how they perceive students. Teachers’ abilities are inseparably linked to the quality of student learning achieved in the classroom (Darling-Hammond, 2006; Hattie, 2009; Stigler & Hiebert, 2009), meaning that not only teachers, but also students, stand to gain from enhanced visual perception in the classroom.

It takes years of professional practice in the classroom to cultivate the knowledge and expertise leading to substantial student learning gains (Berliner, 2001). Our findings provide concrete cues for interpreting classroom interactions and guidelines for training and developing teachers’ visual expertise. Explicating the practical knowledge that develops as teachers gain classroom experience makes it possible to train and transfer the skills, knowledge, and impact of experienced teachers to beginner and developing teachers.

**References**


