[1] Through the eyes of the teacher - Multimodal exploration of expertise differences in the

[2] perception of classroom disruptions

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13   perception of classroom disruptions

Introduction

15   Managing classroom disruptions is a crucial aspect of effective classroom management

16   (Evertson, Weinstein, et al. (2006); Kounin (2006)).

17   Accordingly, teachers must be able to quickly notice and appropriately react to

18   significant events in the classroom. This ability is referred to as classroom professional

19   vision (Goodwin (2015); Sherin (2007)).

20   The process of professional vision can be divided into two main aspects: focusing on

21   relevant situations for learning and teaching ("noticing") and applying knowledge to draw

22   appropriate conclusions in these situations ("knowledge-based reasoning"; Seidel and

23   Stürmer (2014)).

24   Therefore, the early visual perception of classroom disruptions is a key component to

25   effectively maximize students' learning time and minimize classroom interruptions.

26   According to Kounin (2006), these important classroom management strategies are called

27   "withitness" and "overlapping" and can be summarized under the concept of monitoring

28   (Gold and Holodynski (2017)).

29   Learning to develop such classroom management skills is a demanding and complex

30   task for student teachers (Wolff, Jarodzka, Bogert, and Boshuizen (2016)). Research on

31   teacher expertise showed that expert and novice teachers differ in their ability to perceive

32   classroom events, "[...] whereas only a few studies have focused on the basal process of

33   noticing, i.e. the recognition of possible disturbing situations" (Grub, Biermann, and

34   Brünken (2020), p.75). Mobile eye-tracking data can fill this research gap by providing new

35   insights in how expertise differences in teacher´s professional vision manifest in

36   teacher-student interactions (Lachner, Jarodzka, and Nückles (2016); @Wolff et al. (2016)).

Theoretical background

Professional competence

Classroom Management

- Disruptions defintiion

Professional Vision

Expertise

Parameter/Indicators of professional vision

Research Questions

This study examined how the degree of teaching experience influences (a) the number of fixations on relevant areas (e.g., the student performing the disruption), (b) the fixation duration in relevant areas and (c) the time to first fixation on relevant areas, using mobile eye-tracking data in a controlled, micro-teaching setting. Based on the existing literature, we expect expert teachers to outperform novices by (H1) showing more fixations on relevant areas with (H2) shorter fixation durations and (H3) perceiving classroom disruptions faster (cf. Van den Bogert, Bruggen, Kostons, and Jochems (2014)).

Methods

We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study.

Participants

The sample consists of $N = 28$ participants with $n = 7$ expert teachers and $n = 21$ novice teachers.

The inclusion criterion for experts was that they have successfully completed teacher training and are actively employed in the teaching profession. According to Palmer, Stough, Burdenski, and Gonzales (2005), we selected teachers as experts who had at least three years of professional experience and ideally had worked in another teaching position, such as subject advisor or trainer for trainee teachers, in addition to their teaching profession in school. Novices were student teachers who had successfully completed their first internship in a school and gained one to four hours of teaching experience.

The expert teachers (5 women; 71.40%) had a mean age of 45.10 years ($SD = 12$; range: 27-59) and an average teaching experience of 18.10 years ($SD = 14.10$; range: 3-37). 71% of the experienced teachers were also engaged in an secondary teaching activity, such as lecturers at the university, main training supervisors for trainee teachers and subject advisers.

The novice teachers (13 women; 61.90%) had a mean age of 23.30 years ($SD = 1.70$; range: 20-27) with an average teaching experience of 0 years. On average, the student teachers were in their 7.40 semester ($SD = 2.50$; range: 3-11). Furthermore, they had an average teaching experience of 12 teaching units à 45min ($SD = 8.60$; range: 0-36) through the internships during their studies. 90.50% of the student teachers were also engaged in an extracurricular teaching activity, such as tutoring or homework supervision.

The subjects were primarily recruited through personal contacts, social media (Facebook), e-mail distribution lists and advertising in lectures at the University Leipzig. All study procedures were carried out in accordance with the ethical standards of the University's Institutional Review Board. The authors received a positive vote on the study procedures from the Ethics Committee Board of Leipzig University. All participants were

informed in detail about the aim and intention of the study prior to testing. Participation

in the study was voluntary and only took place after written consent has been given.

Material

Eye-Tracking equipment. During the unit, teachers wore a binocular Tobii Pro

Glasses 2 eye-tracker (https://www.tobiipro.com/product-listing/tobii-pro-glasses-2/).

The system consisted of a wearable head unit and a recording unit. As shown in Figure 1,

the head unit was a measuring device with different sensors. A high-definition scene

camera captured a full HD video of the teacher's field of vision. An integrated microphone

recorded the surrounding sounds. Infrared light illuminators supported the eye tracking

sensors which recorded the eye orientation to capure the tacher's gaze point as shown in

Figure 2. The videos were recorded with a sampling rate of 50 Hz in a video resolution

with 1920 x 1080 at 25 frames per second. The scene camera had a field of view of 90 deg.

in 16:9 format (82 deg. horizontal and 52 deg. vertical) and a frame dimension of 179 x 159
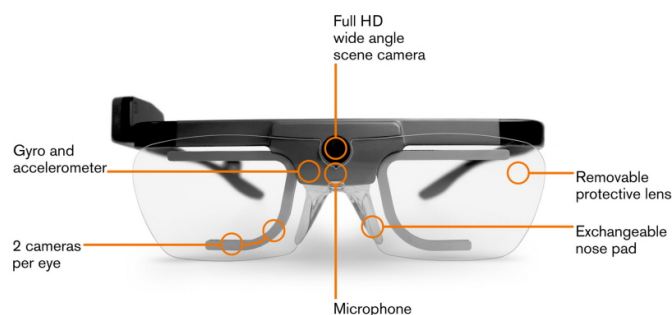
x 57 mm (width x depth x height).

Figure 1. Tobii Pro Glasses 2; Source: https://www.tobiipro.com/product-listing/tobii-pro-glasses-2/

Video and Audio recording equipment. The speech, sounds and voices of the

participants were recorded with Zoom H3-VR Ambient Recorder

Figure 2. Teacher's Gaze Point

(https://zoomcorp.com/en/gb/handheld-recorders/handheld-recorders/h3-vr-360-audio-recorder/) installed in the middle of the lab setting. The Zoom H3-VR recorded with four built-in mics arranged in an Ambisonic array with a bitrate of 4608 kBits/s.

Movements, facial expressions and gestures of the subjects were recorded by four Go Pro Hero 7 black cameras (https://gopro.com/content/dam/help/hero7-black/manuals/HERO7Black_UM_ENG_REVC.pdf) from different angles. The videos were recorded with a sampling rate of 50 Hz in a video resolution with 1920 x 1080 at 50 frames per second in 16:9 format with a linear field of view.

Questionnaire. After each micro-teaching-unit, the students answered items on teaching quality using a validated questionnaire (Helmke et al., 2014) and scales on the teacher's presence behavior. In addition, participants were asked to give a self-assessment on classroom management by completing the questionnaire after each micro-teaching-unit. The questionnaire was a 4-point Likert scale (1 = Strongly Disagree; 2 = Disagree; 3 =

110   Agree; 4 = Strongly Agree).

Procedure

112   In June 2021, the study was piloted with student teachers volunteers to refine the

113   study procedure. Data collection was conducted between July 2021, and July 2022.

Data analysis

115   We investigated whether experts and novice teachers differed

116   All reported data analyses were conducted with the R (Version 4.1.3; R Core Team,

117   2021) and the R-packages *ARTofR* (Version 0.4.1; Zhang, 2021), *cowplot* (Version 1.1.1;

118   Wilke, 2020), *dplyr* (Version 1.0.8; Wickham, François, Henry, & Müller, 2022), *forcats*

119   (Version 0.5.1; Wickham, 2021), *ggplot2* (Version 3.3.5; Wickham, 2016), *gridExtra*

120   (Version 2.3; Auguie, 2017), *knitr* (Version 1.38; Xie, 2015), *ltm* (Version 1.2.0; Rizopoulos,

121   2006), *lubridate* (Version 1.8.0; Grolemund & Wickham, 2011), *MASS* (Version 7.3.55;

122   Venables & Ripley, 2002), *moments* (Version 0.14; Komsta & Novomestky, 2015), *msm*

123   (Version 1.6.9; Jackson, 2011), *needs* (Version 0.0.3; Katz, 2016), *papaja* (Version

124   0.1.0.9999; Aust & Barth, 2020), *polycor* (Version 0.8.1; Fox, 2022), *purrr* (Version 0.3.4;

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126   (Version 1.4.0; Wickham & Bryan, 2019), *rlang* (Version 1.0.2; Henry & Wickham, 2022),

127   *sjPlot* (Version 2.8.10; Lüdecke, 2021), *stringr* (Version 1.4.0; Wickham, 2019), *tibble*

128   (Version 3.1.6; Müller & Wickham, 2021), *tidyr* (Version 1.2.0; Wickham & Girlich, 2022),

129   *tidyverse* (Version 1.3.1; Wickham et al., 2019), *tinylabels* (Version 0.2.3; Barth, 2022),

130   *viridis* (Version 0.6.2; Garnier et al., 2021a, 2021b), and *viridisLite* (Version 0.4.0; Garnier

131   et al., 2021b) and IBM SPSS 28.

Results

Discussion

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