Teachers' focus of attention and teacher-student relationships

Quality of teacher-student relationship in association with teachers' visual focus of attention across Grade 1 using mobile eye-tracking

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Teachers need to relate to students through building relationships that could be influenced by student characteristics in the classroom. Student characteristics are known to predict the quality of teacher-student relationships and attract teacher's visual attention in the classroom. This study goes a step further to investigate, firstly, the association between quality of teacher-student relationships and teachers' visual focus of attention among Grade 1 teachers in fall (N = 48) and spring (N = 50). Secondly, to what extent did the quality of teacher-student relationship predict the association between student characteristics (task-avoidant behavior and basic academic skills) and teachers' visual focus of attention in fall and spring. Pearson correlation analysis showed that there is an association between teacher's visual focus of attention and teacher-student relationship domains of closeness and conflict. Next, mediation analysis showed that, in the fall, increasing student's task avoidant behavior predicted more conflict and less closeness in teacher-student relationship. However, more closeness in teacher-student relationship predicted longer teachers' total fixation duration. In the spring, conflict in teacher-student relationship predicts longer teachers' total fixation duration. Furthermore, lower basic academic skills predicted higher teachers' visual focus of attention in fall but not in spring. Therefore, it could be suggested that teachers need to engage with students who show disruptive behavior to learn about their needs during classroom instruction and develop a warmer relationship with them.

Additional Keywords and Phrases: Mobile eye-tracking, Teachers' gaze behavior, Teacher-student relationship

1 INTRODUCTION

The classroom is a complex environment where the teacher needs to selectively focus their visual attention on relevant events to process information related to student learning and behavior. The complexity arises from multiple events that

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take place at the same time making the information processing challenging for teachers. Accordingly, teacher's eye-movements have been investigated using mobile eye-tracking to gain a deeper insight into their expertise of noticing relevant information (van den Bogert et al., 2014) in terms of student behavior (Yamamoto & Imai-Matsumura, 2013) and academic assessment (Kosel et al., 2020). Previous research has shown that student cues such as behavior, academic skills, motivational and cognitive characteristics have influenced teachers' visual focus of attention (Goldberg et al., 2021; Kosel et al., 2021; Schnitzler et al., 2020). However, little is known about how teacher-student relationships could influence teachers' visual focus of attention in the classroom. Another study showed that teachers' perceived closeness in teacher-student relationships associate with improved students' social skills (Berry & O'Connor, 2010). In addition, closeness in teacher-student relationships has shown to improve students' disruptive behavior and academic performance (Sabol & Pianta, 2012). Since the quality teacher-student relationships have been found to play an important role in student learning and behavior, there is a need to investigate it's influence on teachers' visual focus of attention. Accordingly, this study investigated, firstly, how the quality of teacher-student relationship associated with teachers' visual focus of attention in fall and spring. Secondly, to what extent did the quality of teacher-student relationship predict the association between student characteristics (task-avoidant behavior and basic academic skills) and teachers' visual focus of attention in fall and spring in Grade 1.

1.1 Teachers' visual focus of attention

The term teachers' professional vision was coined to encapsulate teachers' noticing of relevant classroom events followed by interpreting them through knowledge-based reasoning (Seidel et al., 2011). Furthermore, eye-tracking technology has been used to study teachers' noticing in the form of selective visual attention towards targets in the classroom (Dessus et al., 2016; Goldberg et al., 2020; Haataja et al., 2019). In the present study, teachers' visual focus of attention can be defined as teachers' eye gaze behavior towards relevant targets during a lesson in the classroom (van den Bogert et al., 2014). The teachers are required to focus their visual attention selectively towards students irrespective of their characteristics during a lesson. Since classroom is a complex environment, teachers need to process multiple surrounding cues to ensure efficient student learning. There can be unpredictable situations requiring teachers' visual focus of attention in relation to students' behavior. It is possible that the teacher could engage in giving feedback to the students and monitor them based on what they notice in the classroom. Recent eye-tracking studies have showed some interesting aspects of teachers' visual focus of attention. For example, teachers pay more visual attention to students who show interactive and disruptive behavior (Goldberg et al., 2021). In addition, teachers tend to look at students for longer duration when they provide feedback and motivation to students in their tasks (Haataja et al., 2019). Teachers' visual attention is also important in order to accurately judge student's cognitive and motivational characteristics to diagnose their need for support from the teacher (Schnitzler et al., 2020). Moreover, increasing eye-contact between teacher and student is important for the teacher to convey friendliness or authority towards the student as deemed necessary (McIntyre & Mainhard, 2020). Since teachers' visual focus of attention plays an important role in forming their perception of students and also influences communication with students, this study would go a step further to investigate how teachers' perception of the quality of student-teacher relationships could guide teachers' visual focus of attention in the classroom.

1.2 Teacher-student relationships and student characteristics

Teacher-student relationships are typically conceptualized as closeness and conflict (Pianta, 1999; Roorda, et al., 2011). Closeness refers to affection, warmth and openness in the teacher-student relationship and conflict refers to perceived negativity of the teacher towards the student (Jerome et al., 2009) resulting from classroom situations. These relationships can be influenced by student characteristics such as students' behavior and academic skills. Previous research has shown that students' externalizing behavior associated with conflict in teacher-student relationship at elementary school (Roorda & Koomen 2020). In the present study, student characteristics such as basic academic skills in literacy and math along with teacher-perceived students' task avoidant behavior were considered. The students' tendency to avoid challenging tasks has been related to their failure in developing the required academic skills (Zhang et al., 2011). In addition, task avoidance has

been linked to slow development in students' basic academic skills in early school years (Aunola et al., 2002). In this regard, teachers need to provide more individual support and visual attention to influence students' learning outcomes (Nurmi et al., 2018; Seidel et al., 2020). Previous research has also shown that teachers focus more visual attention on students showing interactive or disruptive behavior (Goldberg et al., 2021; Yamamoto & Imai-Matsumura, 2013) and those students who struggle in academics and require adaptive pedagogical action from the teacher (Seidel et al., 2020). However, little is known about how quality of teacher-student relationship associated with teachers' visual focus of attention and predicted the association between student characteristics and teachers' visual focus of attention.

2 METHODS

2.1 Participants and procedure

The data was collected in 2017-18 as a part of a larger research project focusing on teacher and student stress and classroom interaction. In fall, 48 teachers and 650 students and in spring, 50 teachers and 630 students participated from Grade 1 classrooms in Central Finland. Teachers rated their relationship with students using Student-teacher relationship scale (Pianta, 2001) and student's task avoidant behaviors using Behavioral Strategy Rating Scale (Zhang et al., 2011). Students' basic academic skills in math were measured using Basic Arithmetic Test (BAT; Räsänen, & Aunola, 2007) and in reading using Lukilasse word reading test (Lukilasse; Häyrinen et al., 1999). The teacher's visual focus of attention was measured using Tobii Pro Glasses 2.0 to collect eye-tracking recordings for 20 minutes during an authentic lesson on a normal school day. Then, teacher's gaze behavior on targets in the classroom during a lesson was manually coded using Tobii Pro Analyzer v. 1.130. In this study, parameters such as total fixation duration and fixation counts were considered to study teacher's gaze behavior particularly on students.

2.2 Analyses

Firstly, Pearson correlation analysis was used to examine the associations between the study variables such as teachers' visual focus of attention (total fixation duration and fixation counts), students' combined basic academic skills (literacy and math), students' task avoidant behavior and teacher-student relationship (closeness and conflict). Secondly, mediation analysis was conducted using M-plus (Version 7; Muthén & Muthén, 1998–2012) to examine whether quality of teacher-student relationship predicted the association between student characteristics (task-avoidant behavior and basic academic skills) and teachers' visual focus of attention in fall and spring.

3 RESULTS

Firstly, correlation analysis showed that in fall and spring, teachers' visual focus of attention is associated with teacher-student relationship (see Table 1). In addition, student's combined basic academic skills in literacy and math as well as student's task avoidant behavior did not associate with teacher's visual focus of attention at both time points. However, conflict in teacher-student relationship correlated negatively with student's task avoidant behavior ($r = -.083$, $p = .03$) and student's combined basic academic skills ($r = -.127$, $p = .001$) only in the spring.

Table 1

Pearson correlations between teachers' visual focus of attention, quality of student-teacher relationship and student characteristics.

		Teachers' visual focus of attention			
		Total fixation duration (F)	Fixation counts (F)	Total fixation duration (S)	Fixation counts (S)
	Quality of student-teacher relationship				
1.	Closeness	.125**	.072	.086*	.104**
2.	Conflict	.082*	.090*	.175**	.153**
	Student characteristics				

3.	Basic academic skills	.009	−.011	.009	−.035
4.	Task avoidant behavior	.008	.035	.026	.016

Note. ** *p* < .001* *p* < .05, F = Fall, S = Spring.

Secondly, the good-of-fit indices indicated an average model fit in fall, χ2(19, N = 650) = 9.87, p < .001, CFI =.79, RMSEA = .11, SRMR = .02. The mediation analysis consisting of a series of regression analysis showed that in fall, there was a negative significant relationship between students' combined basic academic skills and teacher's total fixation duration (β = −.133, S.E = .046, p =.004). In addition, student's task avoidant behavior showed a significant relationship with closeness (β = −.117, S.E = .04, p =.003) and a positive relationship with conflict (β = .329, S.E = .084, p =.00). Furthermore, closeness also showed a significant relationship with teachers' total fixation duration (β = .145, S.E = .047, p =.002) in the fall. However, the good-of-fit indices indicated a poor model fit in spring as well, χ2(19, N = 630) = 18.39, p < .00, CFI =.85, RMSEA = .16, SRMR = .03. In spring, students' task avoidant behavior showed stronger effect on the teacher's perception of closeness (β = −.159, S.E = .044, p =.00) and conflict (β = .406, S.E = .043, p =.00) than students' basic academic skills. In addition, in the spring, teacher's closeness (β = .113, S.E = .057, p =.019) and conflict (β = .182, S.E = .046, p =.000) significantly predicted teachers' total fixation duration in the classroom.

4 PRELIMINARY FINDINGS

The findings from the first part of this study suggest that there is an association between teachers' visual focus of attention and the quality of teacher-student relationship in both fall and spring indicating that students receive teachers' visual focus of attention irrespective of their behaviors and academic skills. From the second part of this study, the results indicated that in fall, only closeness in teacher-student relationship predicted teacher's total fixation duration suggesting that teachers' feeling of closeness could favor increased attention and interaction towards particular students. It could be possible that increasing conflict in teacher-student relationship with particular students in the fall could be discomforting to the teacher which could possibly result in avoiding their focus on these students. Additionally, in the fall, students' basic academic skills negatively predict teachers' visual focus of attention suggesting that teachers might focus longer on students who struggle in academics. This could indicate that teachers gather more information about students' academic skill levels in fall to know their struggles and support them accordingly (Dessus et al., 2016; Seidel et al., 2020). However, basic academic skill does not seem to predict teacher-student relationship in both fall and spring. This could indicate that Finnish teachers are objective in their assessment of students' academic skills. Furthermore, in spring, students' basic academic skill did not predict both teacher-student relationship and teachers' visual focus of attention. This could possibly indicate that students could be at a more equal level in terms of their academic performances by the end of the academic year and teachers' visual focus of attention may not be necessary for monitoring the students. However, it is interesting to note that students' task avoidant behavior positively predicts teachers' feeling of conflict and negatively predicts teachers' feeling closeness in both fall and spring indicating that teachers feel closer to students that show less task avoidant behavior. This could be somewhat in line with previous research confirming that students showing externalized behaviors also show task avoidant behavior and receive negative feedback from teachers (Metsäpelto et al., 2015). Additionally, students with externalized behaviors are more likely to show less concentration and self-regulation towards their academic tasks resulting in poor academic performance (Metsäpelto et al., 2015). These preliminary findings could suggest that teachers need to identify the conflict issues with students earlier in the academic year and develop ways to engage with all students as equally as possible in order to develop warmer relationships with all students.

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