

Malpique, A., Valcan, D., Pino-Pasternak, D., Ledger, S., Asil, M. & Teo, T. (August, 2023). **Student and Classroom-Level Predictors of Keyboard-Based Writing in Early Primary**. Paper accepted for presentation at the 20th Biennial European Association for Research on Learning and Instruction (EARLI) Conference.

Abstract

In today's fast paced digital world, keyboard-based writing has become a key component in daily communication activities and professional working. Nonetheless, there's a lack of systematic studies investigating keyboarding and its relationship with written products. The current study had two primary aims: 1) to examine unique student-level predictors of keyboard-based writing for Year 2 children, which included keyboarding automaticity, literacy skills (e.g., reading and spelling), executive functioning, writing attitudes, and gender; 2) to examine classroom-level factors predicting keyboard-based writing in Year 2, such as teachers' preparation and instructional practices for writing. The current study involved 544 Year 2 students enrolled in 47 classrooms from 17 primary schools in Western Australia. Student and classroom-level factors were evaluated using multilevel-modelling analyses. Results revealed that keyboarding automaticity, spelling, word reading, reading comprehension, general attitudes toward writing, and gender were uniquely related to keyboard-based compositional quality. Keyboarding automaticity, word reading, and gender were also uniquely related to keyboard-based compositional fluency. Results also showed that female students outperformed their male peers in keyboarding automaticity, compositional quality and fluency, but also on attitudes toward writing and reading comprehension. For classroom-level factors, findings showed time teaching keyboarding and revision strategies positively related to compositional fluency. Time teaching handwriting was negatively related to compositional quality. The novel findings from this study suggest that, to support Year 2 students' keyboard-based writing, attention must be placed on multiple components predicting students' writing performance, including writing and reading skills, motivational factors, and gender, as well as instructional practices promoting effective writing.

Extended Summary

In today's fast paced digital world, developing digital literacy skills, including keyboard-based writing skills, is a key component for academic, professional, and personal success. Traditionally, handwriting has been the main mode of learning, instruction, and assessment in schools worldwide (Bouriga & Olive, 2021). Today, however, the digital revolution brought changes in teaching and learning writing and, in several educational contexts, children are expected to start developing keyboard-based writing skills as soon as they start formal schooling (Malpique et al., 2020; Poole & Preciado, 2016). Hence, it becomes fundamental to understand student and classroom-level factors contributing to the development of students' keyboard-based writing and to understand these factors in early primary education (Donica et al., 2018). While there is a strong body of research showcasing

relationships between student-level skills (e.g., spelling and handwriting) and paper-based writing performance, there is far less evidence for keyboard-based writing performance and instructional influences mediating potential relationships.

This study describes findings from a larger project examining Year 2 students' writing achievement and instruction. The current study involved 544 Year 2 students ($M_{age} = 7.00$, $SD = 0.27$; range = 6-8 years; 54.2% female) enrolled in 47 classrooms from 17 primary schools in Western Australia. Within the schools, a total of 46 teachers (all female), ranging from one to seven teachers per school, agreed to participate in this study. We assessed students' keyboard-based performance when composing short stories, namely keyboarding automaticity, compositional quality and compositional fluency (i.e., total number of words), as well as students' literacy skills (i.e., spelling, word reading and reading comprehension skills), executive functioning skills, and their attitudes toward writing. Year 2 teachers were surveyed on their perceived preparation to teach writing and on the amount and type of writing instruction developed in their students' classrooms. We addressed the following research questions: (1) What are unique child-level predictors (i.e., literacy skills, keyboarding automaticity, attitudes towards writing, executive functioning, and gender) of Year 2 students' keyboard-based writing performance (i.e., compositional quality and compositional fluency)? (2) What are the effects of classroom-level factors (teachers' preparation and instructional practices) on Year 2 students' keyboard-based writing performance after accounting for child-level variables?

The findings from the present study confirmed and extended previous studies by showing how student and classroom-level factors uniquely contribute to keyboard-based writing in early education. Because of the nested nature of the data, we employed multilevel modelling to account for the dependence among the observations. We specified a two-level hierarchical structure for our MLM analyses in which students represented the lower level of analysis (level 1) and classrooms represented the upper-level clustering variable (level 2). Multilevel models were estimated using Restricted Maximum Likelihood Estimation (REML) estimator. We group-mean centred student-level variables and grand-mean centred classroom-level predictors. We conducted the analyses in two steps. In the first step, baseline models were fitted for each outcome variable to examine whether variability occurred at the classroom level and, if so, how much of the total variability (ICC, intraclass correlation coefficient) in compositional quality and compositional fluency could be attributed to the differences among classrooms. In the second step, student and classroom-level predictors were included in tandem to address the research questions.

Multilevel results revealed that students' keyboarding automaticity significantly predicted compositional quality ($\beta = 0.30$, $p < 0.01$) and fluency ($\beta = 2.19$, $p < 0.01$), confirming the role of letter writing automaticity in predicting students' writing performance, including in keyboard-based writing and as early as in Year 2. The other transcription-related variable, spelling, was also found to

positively predict keyboard-based compositional quality ($\beta = 0.05, p=0.04$). Moreover, students' word reading ($\beta = 0.09, p < 0.01$) and reading comprehension skills ($\beta = 0.05, p < 0.05$) were uniquely related to keyboard-based compositional quality. To the best of our knowledge, this is the first study with a large sample of typically developing children showing that students' reading skills at the word and text levels facilitate keyboard-based writing, even after accounting for other student-level factors. Results further revealed that students' attitudes toward writing predicted compositional quality ($\beta = 0.29, p < 0.05$) and that gender was uniquely related to Year 2s' keyboarded compositions ($\beta = -0.90, p=0.02$), with female students outperforming their male peers in keyboarding automaticity, compositional quality and fluency, but also on writing attitudes and reading comprehension measures. While these findings are convergent with previous research showcasing a pattern of female advantage on paper-based writing, they extend knowledge on gender differences in keyboard-based writing.

For classroom-level factors, MLM analyses revealed that Year 2 teachers' preparation to teach writing did not predict keyboard-based compositional quality or fluency. Results further showed that the amount of writing practice did not impact compositional quality and that it was negatively related to compositional fluency ($\beta = -0.04, p < 0.01$). As for time allocated to teaching foundational (i.e., spelling, handwriting, keyboarding, and grammar) and process writing skills (i.e., planning and revision strategies), findings showed amount of time teaching keyboarding ($\beta = 0.06, p=0.01$) and revision strategies ($\beta = 0.06, p < 0.05$) positively related to compositional fluency. Time teaching handwriting was negatively related to compositional quality ($\beta = -0.03, p=0.03$). Additional research, including direct observation and interviews, is needed to focus on the impact of specific instructional practices for teaching keyboarding on students' writing performance, and provide a more precise understanding of the nature and the quality of instructional practices supporting keyboard-based writing.

References

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