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Editorial: The important role of the early school years for reading, writing and math development: assessment and intervention at school entry

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Editorial on the Research Topic

[The important role of the early school years for reading, writing and math development: assessment and intervention at school entry](#)

Introduction

Children start formal schooling in reading, writing, and mathematics with substantially varying learning prerequisites (Davis-Kean et al., 2022; Merrell, 2023). While some children barely know any letters or numbers, others can already read, write, and calculate with great fluency. Lack of letter or number knowledge at entry does not mean that children lack foundational experiences with literacy and numeracy. They bring rich, practice-based resources, including ways of engaging with language, quantity, and space that are often undervalued in school (Moll et al., 1992; Nunes and Bryant, 2015; Rosa and Orey, 2016). Children with less favorable learning conditions are at higher risk for disadvantageous learning outcomes and lack educational success (Sparks et al., 2014; Stanley et al., 2018). As early literacy and numeracy, as well as their precursors, are associated with family background variables, these unequal starting conditions set the stage for later social and ethnic-cultural educational disparities (e.g., Bradley and Corwyn, 2002; Davis-Kean et al., 2022; Skopek and Passaretta, 2021).

Addressing these differences between children requires instruction that builds on sound diagnostic information on their learning prerequisites. The availability of objective, reliable, and valid information regarding students' learning prerequisites should enable teachers to implement targeted interventions and adapt their instruction to meet the individual needs of young learners (Mandinach, 2012). This should result in optimal learning support, compensate for unequal starting conditions, and counteract educational inequalities. These assumptions correspond to the concept of data-based decision making (DBDM; Mandinach, 2012; Souvignier and Förster, 2025). In short, DBDM is a process that covers several central steps, starting with the assessment of data on students' learning prerequisites, then analyzing data to derive instructional interventions, and finally evaluating the interventions' effects. The 14 articles

of this Research Topic address aspects of the DBDM process around the time of school entry (from the last preschool year to grade 2), primarily focusing on assessment and assessment-based interventions.

Generally, assessments must meet standard quality criteria (objectivity, reliability, and validity) to be effectively used for instructional adaptations. In this context, the question arises as to what aspects of learning prerequisites should be assessed to optimize the prediction of future learning outcomes. Moreover, assessments must be economical so that they can be used in the classroom context. Therefore, technology-enhanced assessments that facilitate test administration, scoring, and reporting of results are increasingly being developed. Furthermore, the simple provision of assessment data may not be sufficient to ensure that teachers can derive instructional interventions with manageable effort (Hebbecke et al., 2022). Finally, interventions should be effective. This editorial summarizes the findings of the articles in this Research Topic along the DBDM steps: (1) providing basic knowledge for the development of assessments, (2) providing evidence that assessments are sound, (3) providing evidence on how to support teachers in interpreting and using data for instruction, and (4) providing evidence on effective interventions. Unless otherwise justified by content, we present the studies in each of the following sections according to the domains of reading, writing, and mathematics.

Basic knowledge for the development of assessments

The following articles lay the conceptual groundwork for the design of assessments by examining which early skills predict later outcomes and how these indicators are associated with sociodemographic factors.

In their article “*Morphological awareness predicts reading comprehension in first-grade students*,” Sparks and Metsala focus on a specific predictor of reading comprehension. Their study of English-speaking children from Canada contributes to the understanding of the role of morphological awareness in predicting reading success. They investigated whether morphological awareness uniquely contributes to the prediction of reading after controlling for oral language skills. Their findings indicate that morphological awareness assessed in grade 1 accounts for unique variance in reading comprehension in grade 2.

Sigmund et al. investigate “*Early cognitive predictors of spelling and reading in German-speaking children*.” Their article contributes to the understanding of early spelling and reading skills predictors by explicitly investigating whether predictors assessed before school entry show differential predictive validity for reading and spelling skills in grade 1. Specifically, their results based on a German sample underscore the importance of phonological processing, intelligence, and letter knowledge for predicting grade 1 spelling after accounting for preschool spelling and grade 1 reading skills. In contrast, only rapid automatized naming (RAN) emerged as a significant predictor of reading once preschool reading and grade 1 spelling were controlled for.

The article by Banfi et al. titled “*Longitudinal predictors of reading and arithmetic at different attainment levels*” stands out

by addressing both reading and mathematics, examining not only children at risk for academic failure but also high achievers. Their study advances the understanding of the cognitive foundations underlying the association between reading and arithmetic fluency. Drawing on longitudinal data of over 300 students in Grades 1, 2, and 3 from the UK and Austria, the authors identify both domain-general predictors (e.g., nonverbal IQ) and domain-specific predictors (e.g., phonological awareness for reading and magnitude processing for arithmetic). Notably, most predictors proved to be equally important for high and low achievers.

Concluding this section, the study by Schöfl, Weber et al. titled “*Language abilities and phonological information processing mediate the association of spelling with bilingualism and socioeconomic status*” is placed last because it extends the focus to the socioeconomic and migration-related factors underlying differences in spelling achievement and examines how these effects are mediated by language abilities and phonological information processing. Using an Austrian sample, the authors found that language skills assessed at the very beginning of grade 1 mediate the association between migration-related bilingual status and spelling skills in grade 2, and that the link between socioeconomic status and spelling is partly mediated by language skills and phonological information processing. These findings highlight the importance of promoting language skills and phonological information processing in preschool and at the beginning of primary school to reduce social and ethnic-cultural disparities.

Evidence that assessments are sound

The following articles examine the reliability and validity of assessments, as well as the potential effects of test administration mode, to determine whether the studied instruments provide consistent and accurate measures on which instructional decisions can be based.

Schöfl, Steinmair et al. report in their article “*Using an app-based screening tool to predict deficits in written word spelling at school entry*” results on the validity and diagnostic accuracy of an efficient and cost-free screening tool for identifying spelling problems in community school settings. They used an Austrian sample to examine the predictive validity of different precursors of word spelling, measured at school entry, for predicting spelling difficulties at the end of grade 2. Their results indicate that a screening consisting of the two measures letter knowledge (an aspect of phonological information processing) and sentence repetition (a measure of grammatical knowledge) has an acceptable diagnostic accuracy.

Chatzaki et al. explore the assessment of early mathematical competencies through a playful, game-based approach in their article “*Exploring the potential of a game-based preschool assessment of mathematical competencies using a linear board game called the House of Numbers*.” Drawing on data from a sample of German preschoolers, they examine the reliability and validity of the game-based test. Their results suggest that the House of Numbers is a valid and reliable tool for assessing the mathematical abilities of preschoolers. In addition, they found that the game-based test is an appropriate screening tool with high diagnostic validity for identifying children at risk of low math performance.

Cruz et al. also focus on assessing mathematics skills in the preschool years. In their article “*Assessment of math abilities before school entry: a tool development*,” using a Portuguese sample, the authors provide support for the reliability and validity of a developed screening tool that covers several precursors of mathematics skills assessed during the last year before school entry. They reported high internal consistency of the screening measures and found support for the validity of the screening for predicting grade 1 mathematics achievement.

While these studies validate or develop new assessment instruments for early literacy and numeracy, Seifert et al. focus on a methodological aspect that cuts across assessment context, namely, the potential influence of test administration mode on assessment outcomes. In their article “*Unveiling mode effects in grade 1 vocabulary assessment: the intriguing influence of test mode*,” the authors investigate whether the digital administration of a well-established paper-and-pencil test of receptive vocabulary produces comparable results to the traditional format. In their study with Austrian grade 1 students, they found positive effects of the digital mode, which highlights the need to consider the test mode in the field application of the test and emphasizes the need for further investigations to better understand mode effects. They conclude that ensuring comparability across paper and digital forms will require cross-mode score linking and measurement invariance testing.

Evidence on how to support teachers in interpreting and using data for instruction

The following articles address questions regarding how assessment results can be reported and how they can be effectively aligned with instruction to support data-based decision-making in education.

Extending beyond the validation of assessments, the contributions by Stuhr et al. and Ufer et al. also explore how assessment outcomes might be translated into instructional guidance. In their article “*Exploration of latent early literacy profiles in German kindergarten children using a newly developed app*,” Stuhr et al. use app-assessed data from a German preschool sample to identify latent literacy profiles based on precursors of reading, such as word awareness, phonological awareness, and alphabet knowledge, and suggest profile-specific recommendations on dialogic book reading. This should facilitate the transformation from assessment results to instructional activities. They emphasize the need for experimental and implementation-focused studies to evaluate the effectiveness of the tailored recommendations.

In their article, “*I have three more than you, you have three less than me? Levels of flexibility in dealing with additive situations*,” Ufer et al. assess the flexibility in dealing with additive situations in a sample of second and third-grade German students and develop a model distinguishing discrete levels of flexibility. The authors discuss that assigning students to levels may help teachers make use of assessment results, especially when these are linked to suggestions for instructional adaptations.

Providing evidence on effective interventions

Finally, a total of four articles in this Research Topic deal with the next step of the DBDM process, namely, interventions and what is necessary for interventions to be effective.

In their article “*A brief research report on the efficacy of a RAN training in elementary school age children*,” Wolfsperger and Mayer evaluate an adaptive, software-based RAN training program designed to increase naming speed for children with RAN deficits. Using a German sample of 57 children, their study showed that the naming speed for letters and numbers increased during the training phase. Additionally, they found evidence of a transfer effect of the training on reading speed for words and reading comprehension on the word and sentence levels.

The article by Ennemoser et al. titled “*From developmental theory to effective training: long-term and transfer effects of promoting the quantity-to-number word linkage in grade 1 students at risk for mathematical difficulties*” focuses on a targeted intervention based on an assessment of risk for mathematical learning problems. In detail, they investigate long-term and transfer effects of a quantity-to-number word linkage training in a German sample of grade 1 students. They found that the training had transfer effects on mathematics achievement up to 15 months after the training ended. Therefore, their research provides support for an effective and successful alignment of assessment and intervention.

Powell et al. also focus on an intervention to promote mathematics skills, but address the preschool age. In their article “*Investigation of the initial feasibility of extended mathematics read-alouds used by kindergarten teachers*,” they investigate the feasibility and effects of a mathematics-focused read-aloud program in a US sample. They found no significant effect of the training, but they found evidence that implementation fidelity is significantly associated with outcomes. This highlights the need for high program fidelity when specific programs are used within instructional interventions to achieve desired effects.

While the preceding studies focus on evaluating the effects of specific interventions, Lembke et al. address a central prerequisite for their sustainable impact in practice, namely, implementation fidelity. In their article “*Data-based individualization in early writing: the importance and measurement of implementation fidelity*,” they focus on implementing a data-based individualization approach to promote early writing. Using a US sample, the authors monitor the implementation of DBDM, describe challenges for teachers in implementing DBDM in their classroom, and provide evidence on how to improve implementation fidelity to ensure that evidence-based practices can take effect in everyday school life.

Conclusion

A close examination of the articles in this Research Topic reveals three messages that are largely aligned. Firstly, it is essential to assess early and precisely. Brief, reliable screeners of phonological, letter, language, and early numerical competencies can forecast later literacy and numeracy, and identify both

risk and high attainment. Secondly, the data must be made actionable in an instructional context. While technological advancements and profiling tools can enhance the feasibility of this process, it is imperative to obtain explicit validation for the translation of results into concrete teaching methodologies. Thirdly, alignment of assessment and intervention within sustained data-based decision-making cycles has been demonstrated to engender promising long-term and transfer effects. Implementing well-specified instructional responses with high fidelity and prioritizing language and phonological appears to support for socio-demographically disadvantaged learners has been shown to engender equity gains. Complementarily, assessment and intervention should be guided by an assets-based stance that values children's existing literacies and everyday numerical-spatial competencies, ensuring that data use supports responsive instruction rather than reproducing deficit framings (Moll et al., 1992; Nunes and Bryant, 2015).

To facilitate the implementation of this approach, we advocate integrating low-stakes screening procedures at school entry into the regular curriculum, in accordance with the principles of the Multi-Tiered System of Supports (MTSS) and Response to Intervention (RTI) frameworks (Fuchs and Fuchs, 2006; McIntosh and Goodman, 2016). MTSS/RTI represents a tiered model of early identification and support that aligns universal screening, progress monitoring, and data-based instructional adaptations. These screening procedures should be complemented by the implementation of DBDM routines that follow the same tiered principles of the MTSS/RTI framework and are supported by professional learning opportunities focusing on the interpretation and use of assessment data.

In the context of research, three priorities emerge: firstly, the experimental evaluation of profile-based recommendations; secondly, the establishment of cross-mode equivalence in assessments; and thirdly, the design of studies that explicitly target implementation fidelity and equity impacts. Overall, the reviewed studies collectively illustrate that there is a clear and direct path from early assessment to measurable learning gains in the early school years, provided that the loop from measurement to instruction is effectively closed.

We invite future research to combine scalable assessments with empirically validated instructional routines to demonstrate durable gains at school entry.

Author contributions

MS: Writing – review & editing, Writing – original draft. CW: Writing – original draft, Writing – review & editing. SS: Writing – original draft, Writing – review & editing. NF: Writing – review & editing, Writing – original draft.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

- Bradley, R. H., and Corwyn, R. F. (2002). Socioeconomic status and child development. *Annu. Rev. Psychol.* 53, 371–399. doi: 10.1146/annurev.psych.53.100901.135233
- Davis-Kean, P. E., Domina, T., Kuhfeld, M., Ellis, A., and Gershoff, E. T. (2022). It matters how you start: early numeracy mastery predicts high school math course-taking and college attendance. *Infant Child Dev.* 31:e2281. doi: 10.1002/icd.2281
- Fuchs, D., and Fuchs, L. S. (2006). Introduction to response to intervention: what, why, and how valid is it? *Read. Res. Q.* 41, 93–99. doi: 10.1598/RRQ.41.1.4
- Hebbecke, K., Förster, N., Forthmann, B., and Souvignier, E. (2022). Data-based decision-making in schools: examining the process and effects of teacher support. *J. Educ. Psychol.* 114, 1695–1721. doi: 10.1037/edu0000530
- Mandinach, E. B. (2012). A perfect time for data use: using data-driven decision making to inform practice. *Educ. Psychol.* 47, 71–85. doi: 10.1080/00461520.2012.667064
- McIntosh, K., and Goodman, S. (2016). *Integrated Multi-Tiered Systems of Support: Blending RTI and PBIS*. New York, NY: Guilford Press.
- Merrell, C. (2023). “Children's developmental levels at the start of school,” in *The First Year at School: An International Perspective*, eds. P. Tymms, T. Bartholo, S. Howie, E. Kardanova, M. C. Koslinski, C. Merrell, and H. Wildy (New York, NY: Abingdon: Springer International Publishing), 125–147.
- Moll, L. C., Amanti, C., Neff, D., and González, N. (1992). Funds of knowledge. *Theory Pract.* 31, 132–141. doi: 10.1080/00405849209543534
- Nunes, T., and Bryant, P. (2015). *Children's Reading and Mathematics: The Cognitive Foundations*. Oxford: Wiley.
- Rosa, M., and Orey, D. C. (2016). State of the art in ethnomathematics. *Rev. Latinoam. Etnomatemát.* 9, 1–9. doi: 10.1007/978-3-319-30120-4_3
- Skopek, J., and Passaretta, G. (2021). Socioeconomic inequality in children's achievement from infancy to adolescence: the case of Germany. *Social Forces* 100, 86–112. doi: 10.1093/sf/soaa093

Souvignier, E., and Förster, N. (2025). “Data-based decision-making,” in *Handbuch Bildungsarmut*, eds. G. Quenzel, K. Hurrelmann, J. Groß Ophoff, and C. Weber (Wiesbaden: Springer). doi: 10.1007/978-3-658-44698-7_39-1

Sparks, R. L., Patton, J., and Murdoch, A. (2014). Early reading success and its relationship to reading achievement and reading volume: replication

of ‘10 years later’. *Read. Writ.* 27, 189–211. doi: 10.1007/s11145-013-9439-2

Stanley, C. T., Petscher, Y., and Catts, H. (2018). A longitudinal investigation of direct and indirect links between reading skills in kindergarten and reading comprehension in tenth grade. *Read. Writ.* 31, 133–153. doi: 10.1007/s11145-017-9777-6