



HAL
open science

Using mixed-assessments to evaluate opportunities to learn in mathematics teacher education

Nils Buchholtz, Katrin Vorhölter, Anna Orschulik, Nadine Krosanke

► **To cite this version:**

Nils Buchholtz, Katrin Vorhölter, Anna Orschulik, Nadine Krosanke. Using mixed-assessments to evaluate opportunities to learn in mathematics teacher education. Eleventh Congress of the European Society for Research in Mathematics Education, Utrecht University, Feb 2019, Utrecht, Netherlands. hal-02422430

HAL Id: hal-02422430

<https://hal.science/hal-02422430>

Submitted on 22 Dec 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Using mixed-assessments to evaluate opportunities to learn in mathematics teacher education

Nils Buchholtz¹, Katrin Vorhölter², Anna Orschulik² and Nadine Krosanke²

¹University of Oslo, Norway; N.F.Buchholtz@ils.uio.no

²University of Hamburg, Germany; Katrin.Vorhoelster@uni-hamburg.de, Anna.Orschulik@uni-hamburg.de, Nadine.Krosanke@uni-hamburg.de

Keywords: Summative assessment, formative assessment, e-portfolio, opportunities to learn, mixed methods.

Focus and rationale

Many teacher education programs require practical activities, like internships in schools or teaching experiments. Our task as teacher educators is to evaluate these activities and to assess performance-related achievements, either for certification reasons or for program development. However, the assessment of the development of teaching competence of pre-service teachers in practical teaching activities is methodically challenging. In our study, we wanted to overcome current challenges with this issue by using an innovative methodological approach. In our evaluation study on mathematics pre-service teachers' opportunities to learn (Buchholtz et al., 2018), a mixed-assessment was applied, consisting of a summative assessment (SA) of pre-service teachers' perceived study content and a formative assessment (FA) on situation-specific learning opportunities during internships in schools.

Theoretical background

In their review of research on the assessment of competencies in higher education, Blömeke, Gustafsson, and Shavelson (2015) model competence as a continuum that comprises dispositions, situation-specific skills, and performance. They also point to the challenges of an appropriate assessment: Pure cognitive-analytical approaches (like knowledge tests) lack sufficient validity because relevant parts, like the situational or contextual facets, can be underrepresented, and pure performance-based assessments might neglect the contribution of dispositional resources. Assuming that "the whole is greater than its parts" (p. 9), Kaiser et al. (2017) recommend working with a broader range of combined and situated assessment formats that are able to cover processes mediating the transformation of dispositions into performance. Other authors such as Carr and Claxton (2002) also understand learning as a situated activity; these authors point to the situatedness of what they call learning dispositions. Accordingly, they favour formative assessment (FA) approaches such as interviews and self-reports like those that appear in portfolios when it comes to the assessment of performance-related competence. However, unlike in summative assessment (SA) forms, FA forms presuppose that we have to give up the idea of comparing the achievements of pre-service teachers in a standardised way.

Methodology and corresponding research design

Against this background, two basic ideas of the mixed methods methodology can be transferred to the level of assessment (Kelle & Buchholtz, 2015). Using a *combination* of SA and FA can extend

the scope of the assessment, i.e., both widen and deepen the assessment by gathering as much information as possible on multiple components of the assessed phenomenon or different, but closely related phenomena. The basic idea of an *integration* of SA and FA is to assess one phenomenon with different assessment forms, for example by using SA in a formative way for giving feedback, or integrating FA as a part of an overall SA (Buchholtz, Krosanke, Orschulik et al., 2018).

Respectively, in our study, a panel-survey measuring the professional knowledge and learning opportunities of 187 pre-service teachers was *combined* with the analysis of 30 individual e-portfolios from internships in order to holistically address both dispositional and situation-specific aspects of learning opportunities to develop teaching competence. In particular, the FA during the internship was composed of 18 predetermined tasks affording situation-specific skills. The pre-service teachers had to address the tasks during their observations of other teachers or their own teaching in school, and to work on them as a written contribution to their personal e-portfolio. In favour of an increased interpretability of assessment results, a mutual complementation of the collective findings from the panel study with the findings from individual FA was sought (e.g. when identifying evidence for learning opportunities in FA). This approach might also partly overcome the challenge posed by the inability to standardize FA in teacher education.

Results

With SA data, we were able to determine comparatively that the analysed pre-service teachers had significantly higher perceptions of the number of learning opportunities regarding heterogeneity and research in mathematics education. Additionally, we used the data from the FA to identify pre-service teachers' situation-specific skills and to link the individual learning opportunities of the pre-service teachers with specific situational aspects of the school internships. With this combination, we were able to make detailed statements about the types of learning opportunities the pre-service teachers had, for example when dealing with errors in the classroom or differentiating instruction.

References

- Blömeke, S., Gustafsson, J. E., & Shavelson, R. (2015). Beyond dichotomies: Competence viewed as a continuum. *Zeitschrift für Psychologie*, 223(1), 3–13.
- Buchholtz, N., Krosanke, N., Orschulik, A., & Vorhölter, K. (2018). Combining and integrating formative and summative assessment in mathematics teacher education. *ZDM Mathematics Education*, 50(4), 715-728. <https://link.springer.com/article/10.1007/s11858-018-0948-y>
- Carr, M., & Claxton, G. (2002). Tracking the development of learning dispositions. *Assessment in Education: Principles, Policy and Practice*, 9(1), 9–37.
- Kaiser, G., Blömeke, S., König, J., Busse, A., Döhrmann, M., & Hoth, J. (2017). Professional competencies of (prospective) mathematics teachers: Cognitive versus situated approaches. *Educational Studies in Mathematics*, 94(2), 161–182.
- Kelle, U., & Buchholtz, N. (2015). The combination of qualitative and quantitative research methods in mathematics education: A “mixed methods” study on the development of the professional knowledge of teachers. In A. Bikner-Ahsbals, C. Knipping, & N. Presmeg (Eds.),

Approaches to qualitative research in mathematics education. Examples of methodology and methods (pp. 321–361). Dordrecht: Springer.