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Assessment conceptions of Finnish pre-service teachers

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ABSTRACT

The aim of this quantitative survey study (N = 287) was to investigate the assessment conceptions of three different pre-service teacher groups (classroom teachers, subject teachers and special needs teachers). Assessment conceptions were best described by the following three main factors: 1) assessment of learning, 2) assessment for teaching and learning and 3) assessment as a harmful action. These main factors were clustered into three assessment conception profiles – assessment-cautious, assessment-positive and assessment-critical. Pre-service special needs teachers showed more assessment-oriented conceptions emphasising both the assessment of learning and assessment for learning than the other pre-service teacher groups. However, within every pre-service teacher group, the existing assessment conceptions varied from assessment-positive to assessment-cautious and even assessment-critical. The results are discussed to suggest development in teacher education.

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Introduction

Assessment is essentially linked to teacher's work and is also one of the key areas of teacher education. The pedagogical function of assessment is to monitor and inform both teaching and learning and to promote change when deemed necessary (Remesal 2011). During recent decades, the role of assessment has indeed changed, and the focus of assessment has extended from the summative assessment of learning to formative assessment for learning, emphasising ongoing interaction between assessment and learning (Black and William 1998, 2018). As a result, assessment has become an integral part of all teaching situations. Hence, teachers' assessment skills form a much more complex phenomenon than simply applying certain skills in gathering and interpreting assessment data. According to Hill and Evers (2016), teachers' assessment skills intertwine with individual assessment-related conceptions, and together they regulate how and what for the teacher assesses and interprets and utilises the assessment results. This also affects teacher training as, in addition to the practice of theoretical and practical assessment knowledge and assessment skills, the identification of and reflection on assessment conceptions to support long-lasting conceptual change are needed (Brown 2008; Remesal 2011).

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Teachers' assessment skills and practices have a significant impact on student learning and wellbeing (Arter 2003; Coutts, Gilleard, and Baglin 2011; Gibbs and Simpson 2005; Veldhuis and van den Heuvel-panhuizen 2013). Their assessment conceptions and assessment skills are shaped during teacher education (Smith et al. 2014; Xu and He 2019). However, enhancement of assessment knowledge does not necessarily mean change in assessment conceptions (Deneen and Brown 2016). Pre-service teachers begin their studies with varying levels of assessment knowledge and experience. Nevertheless, assessment-related conceptions and practices of in-service teachers continue to differ (Brown 2004; Remesal 2011). Thus, even though skills and conceptions take shape during teacher education, this process and its outcomes are individual.

In the current study, the aim was to investigate the extent to which the types of assessment conceptions of three different pre-service teacher groups with a similar societal and cultural Finnish context but somewhat different professional contexts (classroom teachers, subject teachers and special needs teachers) differ. Even though they all shared a common goal as teachers, they differed with respect to the target teacher qualification. In practice, this may mean differences with respect to background (prior studies and teaching experience), study contents, future work orientations and assignments and societal expectations. Despite these differences, while working in the teaching profession, assessment will be one important and inevitable part of their future work as teachers, and collaboration with other teacher groups is expected as well. Prerequisite for effective collaboration is that the different teacher groups have a shared understanding, shared conceptions of how and why the assessment is carried out (see e.g. Harlen 2005). At present, there is lack of research that would allow the comparison of assessment conceptions of different pre-service teacher groups that should be collaborating in the future at schools.

Teacher assessment conceptions

Assessment conceptions are evolving representations of an individual's intuitive understanding of assessment (Brown 2008). This understanding is primarily shaped by the interaction between individual knowledge, beliefs and emotions. Xu and Brown (2016) further suggest that conceptions consist of both a cognitive and an affective dimension that regulate how susceptible conceptions are to change. The cognitive dimension refers to the interaction between knowledge and individual beliefs about knowledge, which affects the process of accepting, adopting and constructing new information. The further the 'new' knowledge that is provided during theoretical studies or practical periods is from the existing conceptions, the more challenging it is to change those conceptions (Xu and Brown 2016). This process also intertwines the affective dimension of conceptions, which includes previous assessment-related emotional experiences. These emotional experiences can be either positive or negative and either strong or weak (Crossman 2007). The stronger the experiences are, the stronger they are suggested to maintain existing conceptions (Xu and Brown 2016). The process of change is central from the teacher education point of view as its main goal is professional growth during teacher education and beyond.

Assessment conceptions are shaped in the interaction between personal, professional and external political contexts (see Mockler 2011). Conceptions of both in-service teachers (Brown et al. 2011), and pre-service teachers (Brown and Remesal 2012) reflect societal

and cultural practices and are thus context-dependent. While the personal context includes assessment experiences before and outside teacher education and teaching experiences, the professional context refers to theoretical and practical experiences during teacher education and work as a teacher. Previous studies have shown that prior personal experiences of being assessed, before teacher education, play a significant role in structuring one's assessment conceptions (Crossman 2004, 2007). For instance, students with negative experiences may have more negative conceptions of assessment than students who do not share similar negative experiences. Similarly, experiences of being assessed continue to shape assessment conceptions during teacher education (Smith et al. 2014). Considerable change in conceptions has also taken place during practicum periods (Levy-Vered and Alhija 2018; Xu and He 2019). The external political context comprises a framework that directs pre-service teachers' conceptions via public debate (mostly via media) and political decisions. Both public debate as well as societal and political decisions concerning teachers' work, assessment and teacher education shape pre-service teachers' conceptions of what is expected of them as a teacher and as an assessor.

So far, assessment conception studies have included pre-service primary school (Daniels and Poth 2017; Hawe 2007; Xu and He 2019) and pre-service secondary school teachers (Daniels and Poth 2017) as well as in-service primary school (Brown 2004; Remesal 2011; Veldhuis and van den Heuvel-panhuizen 2013) and secondary school teachers (Remesal 2011). Previous research has focused widely on assessment purposes. Three main purposes, improving teaching and learning, making students accountable and making schools accountable, have been suggested by Brown (Brown 2008). In addition, the conception of assessment as irrelevant is prevalent among in-service teachers and pre-service teachers (Barnes, Fives, and Dacey 2017; Brown 2008; Kyttälä et al. 2021). Several studies have shown that the most prominent purpose of assessment among in-service teachers and pre-service teachers is improving their teaching and students' learning (Brown 2008; Levy-Vered and Alhija 2018). However, previous research has shown that teachers' conceptions differ in terms of whether they emphasise assessment for learning or assessment of learning (Barnes, Fives, and Dacey 2014; Kyttälä et al. 2021). Previous studies have suggested different teacher types based on assessment conception profiles. Conceptions emphasising assessment for teaching and learning were typical for the Pro-Formative group in Brown's (2008) study, the Teaching and Learning-oriented type in Barnes, Fives, and Dacey (2017) and the Assessment Positives (Kyttälä et al. 2021). Cautious and neutral assessment conceptions were typical for the Traditionalists suggested by Brown (2008), the Moderate type suggested by Barnes, Fives, and Dacey (2017) or the Assessment Cautious suggested by Kyttälä et al. (2021). Conceptions related to assessment as inaccurate, ignored and bad were typical for the 'Assessment as Irrelevant' teacher type reported by Barnes, Fives, and Dacey (2017), and the Assessment Criticals reported by Kyttälä et al. (2021).

Teachers' conceptions also differ in level of depth and diversity of reflection (Halinen et al. 2014). Pre-service teachers' assessment conceptions are suggested to be related to their assessment approaches (Daniels and Poth 2017). Daniels and Poth (2017) observed that conceptions that assessment improves teaching were related to a mastery approach to assessment, and conceptions that assessment holds students accountable were related to a performance approach to assessment. Previous studies have also

shown that although pre-service teachers have a strong understanding of the principles of assessment for learning and are theoretically aware of the different assessment methods, they do not necessarily apply them in practice (Deneen et al. 2019; Siegel and Wissehr 2011). Thus, possession of theoretical knowledge does not automatically entail its utilisation.

Finnish educational context

Teacher pre-service education (class teachers, subject teachers and special needs teachers) in Finland is based on a master's degree (300 ECTS credits/about five years in the university programme). With a previously earned master's degree (class teacher or subject teacher), one can also become qualified as a special needs teacher by having 60 additional ECTS. The content of the teacher education curricula differs to some extent according to professional field and university.

The Ministry of Education and Culture defines the national educational standards that are locally implemented in curricula by schools (www.minedu.fi). According to the Finnish National Core Curriculum, the main tasks of assessment are to guide and encourage learning and develop students' self-assessment skills (formative assessment) and to determine the extent to which the student has achieved the objectives set for the subject (summative assessment). Assessment can be either continuous during a course or final in the end of every course/school year. Continuous assessment during a course is often informal, and the task is to encourage studying and to support students in the learning process (formative assessment). During the first four years of primary education, final summative assessment at the end of a course/school year can be verbal, numerical or both. After that, students are graded using a scale of 4–10 (4 = failed; 5 = adequate ... 10 = excellent), which describes the level of performance compared to the objectives of the curriculum. These objectives can be considered as vague standards set in the form of criteria (Vainikainen et al. 2017). Key principles in the core curriculum for assessment are equality, co-operation and participation, consistency, versatility and explicit objectives and criteria. These main aims and principles guide the assessment work of all teachers.

Since the renewed Basic Education Act (implemented in August 2011), there has been a national three-tier framework called 'Support framework for learning and schooling', which has the following three tiers of support for learning: general support (including e.g. co-teaching and differentiated teaching as forms of support), intensified support (domain-specific learning plans and typically support in flexible groups in addition to forms of support mentioned above) and special support (all previously mentioned forms of support and individualised education plans). On each tier, the student is entitled to a variety of forms of support (e.g. even special education; see Björn et al. 2016), and the framework is based on the ongoing assessment of the support provided. This three-tiered support system is obligatory for all teacher groups, especially at the level of general support. The role of special needs teachers becomes stronger as support levels progress. The model is supposed to shift the focus of assessment to the effectiveness of teaching and support and from the learner to the teacher, pedagogy and learning environment, which is typical of the Response-To-Intervention (RTI)-like approaches (Björn et al. 2018; Fuchs and Fuchs 2005; Grigorenko 2009).

The somewhat different work assignments of different teacher groups (classroom teacher, subject teacher and special needs teacher) set certain demands and emphases on assessment. Classroom teachers work at the primary level, and they are expected to master, teach and assess several subject contents and practices. Subject teachers work at both the primary and secondary levels, and their expected assessment skills involve not only being able to assess the mastery of subject content but also knowledge about the subject itself and subject-related practical skills (Gott and Duggan 2002). Both informal low-stakes formative assessment as well as achievement-based summative assessment are expected from both teacher groups. The achievement-based summative assessment of subject content takes on an increasingly important role at higher grade levels. Special education teachers work at both the primary and secondary levels, and their work includes three main areas of teaching, consulting and background work, the latter of which includes assessment, planning and making or selecting instructional materials (Takala, Pirttimaa, and Törmänen 2009; Takala et al. 2018). All of these areas are linked to the continuous, systematic and regular formative assessment of learning progress and the effectiveness of the support provided. Both indirect practices (observation, discussions) and tests, assessment forms and exams are used as a tool for assessment (Virinkoski et al. 2020).

In general, the Finnish educational system is low-stakes and improvement-oriented. The final assessment at the end of the nine-year compulsory schooling is based on the objectives of basic education (defined in the curriculum) but not national, high-stakes tests. The matriculation exam taking place at the end of the upper secondary school is the first actual high-stakes test in the Finnish educational system. Moreover, there is no centralised school evaluation system in Finland.

Current study

The current study will capture Finnish pre-service classroom teachers', subject teachers' and special needs teachers' assessment conceptions and different conception profiles. To understand the processes behind teachers' assessment practices, we need information on the conceptions that guide these practices. This is particularly important for pre-service teachers as the possibility for and direction of potential conceptual change during teacher education may depend on their existing conceptions (Xu and Brown 2016).

This study extends to previous studies in three ways. First, instead of separately targeting pre-service primary school teachers (Hawe 2007; Xu and He 2019) or comparing pre-service primary and secondary school teachers (Daniels and Poth 2017), it compares the assessment conceptions of three different pre-service teacher groups, including pre-service special needs teachers whose assessment conceptions have been rarely studied (however, see Kyttälä et al. 2021). Second, this study will also deepen our understanding of assessment conceptions in different cultural and educational contexts. Since assessment conceptions have been shown to be dependent on context, culture and local factors (Brown, Gebriel, and Michaelides 2019), it is important to also study conceptions in an educational context with a relatively low-stakes, improvement-oriented policy and practice of assessment. Despite relatively uncontrolled and unstandardised assessment settings, Finland has achievement outcomes well above the OECD average in reading, mathematics and science knowledge (OECD 2019) as well as homogeneous school-level

performance (Vainikainen et al. 2017). Third, the study expands the research examining the assessment conceptions of Finnish teachers from university-level teachers (see, for example, Halinen et al. 2014; Postareff et al. 2012) to pre-service teachers who will mainly work at lower levels of education (primary, lower secondary and upper secondary). The assessment conceptions of these groups have been rarely studied in Finnish context (see however Kyttälä et al. 2021 for pre-service special needs teachers; Lutovac and Flores 2021 for pre-service subject teachers).

In the current study, we will answer the following research questions:

- (1) To what extent do the assessment conceptions of three pre-service teacher groups (class teacher, subject teacher and special needs teacher) differ?
- (2) What kinds of profiles of assessment conceptions can be identified among pre-service teachers?
- (3) To what extent do different assessment conception profiles differ according to prior teaching experience, prior educational studies or target qualification?

Based on our previous data concerning pre-service special needs teachers (Kyttälä et al. 2021), we expected that the assessment conceptions of pre-service teachers would form the following three main factors: assessment of learning, assessment for teaching and learning and assessment as a harmful action, all of which would be emphasised differently in each assessment conception profile.

Methods

Participants and data collection

Pre-service teachers ($N = 287$) representing three Finnish universities participated in this study. The distribution of the participants in different pre-service teacher programmes was as follows: classroom teachers ($n = 110$; female = 82 [75%], one preferred not to report gender), subjects teachers ($n = 43$; female = 30 [70%]) and special needs teachers ($n = 134$; female = 121 [86%], one preferred not to report gender). The pre-service subject teachers represented a variety of different subjects. Forty-one percent of pre-service special needs teachers had a prior master's degree, including teacher qualification (class teacher or subject teacher), and they were thus completing their additional 60 study credits to qualify as special needs teachers. The gender distribution corresponds to the typical proportion of females among classroom teachers (79%), subject teachers (76%) and special needs teachers in Finland (86%; Honkala and Komppa 2020). The respondents' ages varied from 18 to 57 ($M = 26.55$, $SD = 7.82$).

The data for this study were gathered via a web-based questionnaire. The link to the questionnaire was shared on the Moodle platforms of the study courses or by email. The exact response rate is not available since the link was provided via course pages or email lists that reached other students as well. Participation in the study was voluntary, and all participants signed an informed consent form before participation. No Ethics Committee statement was required according to the national guidelines (TENK. 2019. The ethical principles of research with human participants and ethical review in the human sciences in Finland. Finnish National Board on Research Integrity TENK guidelines 2019).

Instrument

The online questionnaire (Table 1) included items on the teachers' background characteristics, such as pre-service teacher group (1 = classroom teacher, 2 = subject teacher, 3 = special needs teacher), age (in years), the amount of previous studies both in the field of education and special education (0 = no previous study units, 1 = basic studies [25 ECTS], 2 = intermediate studies [35 ECTS] and 3 = advanced studies [70–90 ECTS]) and teaching experience (both general and special education teaching included but not specified) in full years except for those who had less than one year experience and were thus given the value of 0.5 years.

Assessment conceptions were measured with 20 items that were constructed, used and previously reported in the Finnish context (Kyttälä et al. 2021). It included 10 items from Brown's (2004) COA-III Instrument (Teachers' Conceptions of Assessment) and 10 items constructed for the Finnish context to cover the essential issues of the national standards of assessment in education (www.minedu.fi) and to complement the special educational perspective (see Table 2 for item descriptions). The 10 statements from the COA-III represented four purpose-defined conception themes (assessment: describes, improves learning, improves teaching, is bad) that are relevant in the Finnish educational context. The statements were translated into Finnish. The other 10 statements were constructed in co-operation with Finnish experts in special education, assessment and didactics. In addition to the authors of this manuscript, certain experts in the field commented on the preliminary version of the statements, helping to modify and complete them. The final statements addressed assessment of learning (5 items; e.g. assessment sums up student learning), assessment for teaching and learning (10 items; e.g. assessment supports learning, assessment helps to improve the quality of teaching) and assessment as harmful (5 items; e.g. assessment is unfair). The participants were asked to determine what they think about certain statements addressing assessment on a scale from 1 to 7 (1 = completely disagree; 7 = completely agree).

Table 1. Summary of the online questionnaire.

	Response scale
Background characteristics	
Pre-service teacher group	1 = Classroom teacher, 2 = Subject teacher, 3 = Special needs teacher
Age	In years
Previous studies in education	0 = no previous study units, 1 = basic studies [25 ECTS], 2 = intermediate studies [35 ECTS] and 3 = advanced studies [70–90 ECTS]
Previous studies in special education	0 = no previous study units, 1 = basic studies [25 ECTS], 2 = intermediate studies [35 ECTS] and 3 = advanced studies [70–90 ECTS]
Teaching experience	In full years (except if experience < 1 year = 0.5)
Assessment conceptions	
Assessment of learning (5 items; e.g. <i>Assessment sums up student learning</i>)	1 = completely disagree; 7 = completely agree
Assessment for teaching and learning (10 items; e.g. <i>Assessment supports learning, Assessment helps to improve the quality of teaching</i>)	1 = completely disagree; 7 = completely agree
Assessment as harmful (5 items; e.g. <i>Assessment is unfair</i>)	1 = completely disagree; 7 = completely agree

TABLE 2. Confirmatory factor analysis for the assessment conception scale

Items	Factor 1	Factor 2	Factor 3
Assessment supports learning.	.891		
Assessment provides information on different learning needs.	.750		
*Assessment allows different students to get different instruction.	.749		
*Assessment help students improve their learning.	.738		
*Assessment modifies the ongoing teaching of students.	.731		
Assessment helps to develop the learning climate.	.688		
Assessment provides information on how the support provided has benefited the student.	.631		
*Assessment is integrated with the teaching practice.	.628		
Assessment guides the planning of teaching.	.622		
*Assessment provides feedback to students about their performance.	.602		
*Assessment identifies student strengths and weaknesses.		.844	
Assessment sums up student learning.		.831	
*Assessment establishes what students have learned.		.728	
Assessment predicts student performance.		.504	
*Assessment predicts future student performance.		.298	
Assessment negatively affects students' perceptions of themselves.			.753
*Assessment is unfair.			.708
*Assessment interferes with teaching.			.546
Assessment exposes students to comparing each other's performance.			.494
Assessment takes up too much of teachers' work time.			.368

Note. Factor 1: Assessment for teaching and learning ($\alpha=.91$); Factor 2: Assessment of learning ($\alpha=.79$); Factor 3: Assessment as harmful ($\alpha=.69$).

*=The item is from Brown's (2004) COA-III Instrument.

Analysis

The data was analysed using a combination of variable-centred (CFA, MANOVA) and person-centred approaches (Cluster analysis; see Howard and Hoffman 2018). The following steps were conducted in the statistical analyses. First, descriptive statistics were calculated for the demographic variables. Second, confirmatory factor analysis (CFA) using Amos 26.0 was conducted to test whether the three-factor assessment conception structure presented by Kyttälä et al. (2021) using the exact same instrument fits the current data. CFA lends acceptable support to the three-factor structure of 1. *Assessment for teaching and learning* ($\alpha = .91$; 10 items; example item: 'Assessment supports learning'), 2. *Assessment of learning* ($\alpha = .79$; 5 items; example item: 'Assessment sums up student learning') and 3. *Assessment as harmful action* ($\alpha = .69$; 5 items; example item: 'Assessment is unfair'. ($\chi^2/df = 2.46$, CFI = .93, RMSEA = .06; Hooper, Coughlan, and Mullen 2008; Steiger 2007; West, Taylor, and Wu 2012) Table 2 after some error covariances between items in the same latent factor were added according to modification indices. As Table 2 shows, there were two items showing statistically significant but low loadings, one in Factor 2 (.298) and one in Factor 3 (.368). We continued by testing the three-factor model without these two items. Since the fit of the model was not better ($\chi^2/df = 2.56$, CFI = .93, RMSEA = .07), and since the two items were theoretically justified, we decided to keep the items with lower loadings in the final model. We also tested the four-factor structure with separate factors for assessment for teaching and assessment for learning as suggested by Remesal (2011). Also, the four-factor structure was supported by CFA ($\chi^2/df = 2.35$, CFI = .93; RMSEA = .06). However, since neither of the two models was better than the other, and the law of parsimony suggests that it is best to present the simplest model (Bollen 1989), we preferred the three-factor model. Third, regression-based factor scores were saved as composite scores of assessment conception factors for subsequent use in further analysis. Fourth, to answer our first research question, between-pre-service teacher

groups differences in all three composite scores were analysed using MANOVA. Fifth, to answer our second research question, to identify the different assessment conception profiles, cluster analysis was conducted using the K-means method, which is suggested to work well in small-to-medium-size samples (Jiawei, Kamber, and Pei 2011). The number of clusters was first determined by inspecting the results of hierarchical cluster analysis (dendrogram and agglomeration schedule; see e.g. Gore 2000) and by testing three- and four-cluster solutions using K-means method. The three-cluster solution was preferred because it was theoretically interpretable, in concordance with the solution presented by Kyttälä et al. (2021), and supported by hierarchical cluster analysis. Sixth, to further test the fit of the cluster solution, discriminant analysis (all composite scores entered together) was conducted. Finally, to answer our third research question, to investigate whether the assessment conception profiles differed according to prior teaching experience, prior educational studies or pre-service teacher group, ANOVAs with prior teaching experience in years and prior educational studies as dependent factors were conducted, and a chi-squared test for independence between clusters and pre-service teacher groups was calculated.

Results

Descriptive statistics and differences between pre-service teacher groups

For descriptive statistics for demographic variables and composite scores, see Table 3. The skewness and kurtosis values for the composite scores met the criteria for normality. From demographic variables, both age and prior teaching experience were skewed and peaked because most of the participants in the current data were young in age and had only minor teaching experience. Of the participants, 73.2% had less than a year of teaching experience, and almost 50% of all participants (47.7%) were 23 years old or younger. For the teaching experience, several scoring options were tested to make the distribution more normal. These alternative variables did not change the results of the analysis in which the teaching experience was involved, so we ended up using the original variable. The association between composite scores was determined by means of Pearson correlation analysis. 'Assessment for teaching and learning' correlated positively and significantly with 'Assessment of learning' ($r = .678$; $p < .001$), and negatively and significantly with 'Assessment as harmful' ($r = -.720$; $p < .001$). 'Assessment of learning' correlated significantly and negatively with 'Assessment as harmful' ($r = -.447$; $p < .001$).

An inspection of between-teacher-group differences in demographic variables (see Table 3) showed that pre-service special needs teachers were significantly older in age than classroom teachers ($p < .001$) and subject teachers ($p < .001$). This is explained by the fact that 41% of them had a prior master's degree, including teacher qualification (class teacher or subject teacher), and they were thus completing their additional 60 study credits to qualify as special needs teachers. Special needs teachers also had significantly more prior teaching experience than classroom teachers ($p < .001$) and subject teachers ($p < .001$). When comparing previous studies in education, pre-service special needs teachers had significantly more studies than pre-service classroom teachers ($p < .001$).

Table 3. Descriptive statistics of the key variables.

Measure	All participants (N = 287)				1. Classroom teachers (n = 110)			2. Subject teachers (n = 43)			3. Special needs teachers (n = 134)			Post hoc ^d	
	M	Sd	Skew	Kurt	M	Sd	Kurt	M	Sd	Kurt	M	Sd	Kurt		F
Age	26.55	7.82	1.76	2.70	23.33	4.72	2.70	24.53	2.96	2.96	29.84	9.47	26.66***	.158	3 > 1, 2
Studies in education	1.463	1.054	.44	-1.04	.900	.967	-1.04	1.232	.571	.571	1.321	1.199	5.13***	.035	3 > 1
Studies in special education	.620	.868	1.27	.69	.191	.516	.69	.070	.258	.258	1.149	.922	69.44***	.328	3 > 1, 2
Prior teaching experience	2.05	4.43	3.36	12.28	.509	1.202	12.28	.698	1.042	1.042	3.739	5.932	20.10***	.129	3 > 1, 2
Assessment for teaching and learning	.000	.692	-4.98	-1.11	-.105	.653	-1.11	-.167	.726	.726	.140	.692	5.41**	.037	3 > 1, 2
Assessment of learning	.000	.578	-.502	.169	-.076	.524	.169	-.202	.582	.582	.128	.593	7.14***	.048	3 > 1, 2
Assessment as harmful	.000	.428	.031	-3.17	.032	.409	-3.17	.071	.374	.374	-.050	.457	1.80	.012	—

*** p < .001, ** p < .01, * p < .05. ^a = significant group differences.

did. No other significant differences emerged. Special needs teachers also had significantly more special education studies than classroom teachers ($p < .001$) and subject teachers ($p < .001$).

The between-teacher-group MANOVA showed that the pre-service teacher groups differed significantly in *Assessment for teaching and learning* and in *Assessment of learning* (Pillai's Trace = .05, $F(6, 566) = 2.64$, $p < .05$, $\eta^2 = .03$; Table 3). Pairwise post hoc tests showed that in *Assessment for teaching and learning*, pre-service special needs teachers had significantly higher scores than pre-service classroom teachers ($p = .006$) and pre-service subject teachers ($p = .011$). In addition, in *Assessment of learning*, pre-service special needs teachers had higher scores than pre-service classroom teachers ($p = .005$) and pre-service subject teachers ($p = .001$). In *assessment as harmful*, there were no significant group differences. The differences between teacher groups in composite scores remained after controlling for prior teaching experience and previous studies in education. However, when controlling for previous studies in special education, the observed group differences in *Assessment for teaching and learning* were no longer statistically significant.

Different assessment conception profiles

Composite scores reflecting the assessment conceptions of all pre-service teachers clustered together in three different assessment conception profiles. Cluster profiles based on standardised z-scores are presented in Figure 1. Descriptive statistics of the cluster profiles are presented in Table 4. Cluster means per factor were classified high if they were above the 75th percentile of the whole data set, average if they were between the 25th and 75th percentile and low if they were below the 25th percentile. The first cluster ($N = 123$, 42.9%) represents pre-service teachers with average scores in '*Assessment for teaching and learning*', average scores in '*Assessment of learning*' and average scores in '*Assessment as harmful*' (from here forth '*Assessment Cautious*'). The second cluster ($N = 114$, 39.7%) represents pre-service teachers with high scores in '*Assessment for teaching and learning*', average scores in '*Assessment of learning*' but low scores in '*Assessment as harmful*' (from

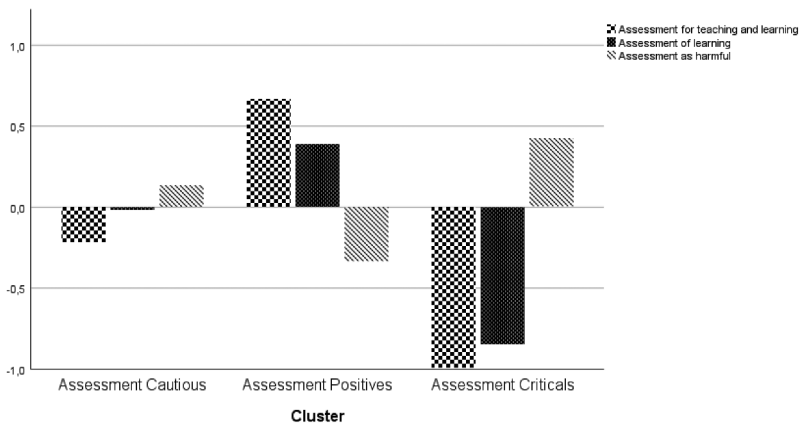


Figure 1. Z-scores of the cluster profiles.

Table 4. Descriptive statistics of the cluster profiles.

Measure	1 Assessment Cautious (n = 123)		2 Assessment Positives (n = 114)		3 Assessment Criticals (n = 50)		F	η^2	Post hoc ^a
	M	Sd	M	Sd	M	Sd			
Age	26.163	7.287	27.921	8.283	24.360	7.819	3.944**	.027	2 > 3
Assessment for teaching and learning	-.217	.323	.670	.250	-.994	.472	491.293***	.776	2 > 1 > 3
Assessment of learning	-.017	.318	.389	.440	-.846	.411	177.382***	.555	2 > 1 > 3
Assessment as harmful	.137	.297	-.335	.332	.429	.318	122.401***	.463	3 > 1 > 2
Studies in education	1.15	1.02	1.31	1.1	.760	.94	4.81**	.033	1, 2 > 3
Studies in special education	.642	.88	.73	.90	.32	.71	3.99*	.027	1, 2 > 3
Prior teaching experience	2.09	4.68	2.25	4.22	1.47	4.30	.548	.004	-

*** $p < .001$, ** $p < .01$, * $p < .05$. ^a = significant group differences.

here forth 'Assessment Positives'). The third cluster (N = 50, 17.4%) represents students with high scores in 'Assessment as harmful' and low scores in 'Assessment for teaching and learning' and 'Assessment of learning' (from here forth 'Assessment Criticals').

The discriminant analysis confirmed the fit of the cluster solution (Wilks' $\lambda = 0.174$; $\chi^2 = 494.27$; $df = 6$; $p < .0001$). The cross-validated classification showed that, overall, 95.8% of the grouped cases were correctly classified. The MANOVA test confirmed that all the three clusters significantly differed in all composite scores (Pillai's Trace = .89, $F(6, 566) = 76.038$, $p < .001$, $\eta^2 = .45$; Table 4).

The one-way MANOVA showed that the clusters differed significantly in prior studies in education and special education but not in prior teaching experience (Pillai's Trace = .06, $F(6, 566) = 2.65$, $p < .05$, $\eta^2 = .03$; Table 4). Assessment Criticals (M = 0.76; SD = 0.94) had significantly less prior studies in education than Assessment Cautious (M = 1.15; SD = 1.02) or Assessment Positives (M = 1.31; SD = 1.10). Assessment Criticals (M = 0.32; SD = 0.71) also had significantly less prior studies in special education than Assessment Cautious (M = 0.64; SD = 0.88) or Assessment Positives (M = 0.73; SD = 0.90). Based on crosstabs and a chi-squared test for independence, the three pre-service teacher groups were differently represented in three clusters ($\chi^2(4, 287) = 15.02^{**}$; Table 5). Most of the pre-service classroom teachers (n = 49, 44.5%) and pre-service subject teachers (n = 21, 48.8%) belonged to the cluster Assessment Cautious, while most of the pre-service special education teachers belonged to the cluster Assessment Positives (n = 67, 50.0%). The Assessment Positives cluster also had quite a few pre-service classroom teachers (n = 36, 32.7%) and pre-service subject teachers (n = 11, 25.6%). The Assessment Critical cluster was the smallest. Pre-service subject teachers (n = 11, 25.6%) were percentually most represented amongst Assessment Criticals compared to pre-service classroom teachers (n = 25, 22.7%) and pre-service special needs teachers (n = 14, 10.4%).

Table 5. Cross tabulation: Cluster profile and pre-service teacher group.

Pre-service teacher group	Cluster profile		
	Assessment Cautious	Assessment Positives	Assessment Criticals
Classroom teacher (n = 110)	49 (44.5%)	36 (32.7%)	25 (22.7%)
Subject teacher (n = 43)	21 (48.8%)	11 (25.6%)	11 (25.6%)
Special needs teacher (n = 134)	53 (39.6%)	67 (50%)	14 (10.4%)
Total (N = 287)	123 (42.9%)	114 (39.7%)	50 (17.4%)

Discussion

In the current study, we investigated the assessment conceptions within three different pre-service teacher groups – classroom teachers, subject teachers and special needs teachers. This was particularly interesting, as the participants shared a similar societal and cultural context but somewhat different professional contexts. The results confirmed, first, that Finnish pre-service teachers' assessment conceptions were best described by three main factors of assessment of learning, assessment for teaching and learning and assessment as a harmful action. This result is in concordance with Barnes, Fives, and Dacey (2017), Brown (2004); Lutovac and Flores (2021) and Kyttälä et al. (2021), suggesting that assessment for teaching and assessment for learning are strongly intertwined and thus represent congruent aspects of formatively oriented assessment conceptions (see also Frey and Schmitt 2007). Our results show that pre-service special needs teachers place more emphasis on both assessment of learning and assessment for learning than pre-service classroom and subject teachers and were thus more assessment-oriented. However, the three pre-service teacher groups did not differ in the negative conception dimension (assessment as a harmful action).

Second, the main assessment conceptions clustered into three assessment conception profiles (i.e. type of assessment conception profile) of Assessment Cautious, Assessment Positives and Assessment Criticals, in which the three pre-service teacher groups were unequally represented. Assessment Cautious had near average scores (just below or above) on every dimension, reflecting a more cautious or moderate approach to assessment compared to the other profiles. With their cautious and neutral conceptions, they resemble the Traditionalists suggested by Brown (2008) or the Moderate type suggested by Barnes, Fives, and Dacey (2017). Similarly to the Moderate type in Barnes, Fives, and Dacey (2017), they had higher scores in assessment as harmful compared to assessment for teaching and learning or assessment of learning. The Assessment Positives emphasised assessment for teaching and learning, recognised the need for assessment of learning and had very low scores in assessment as harmful. Their conceptions are in line with the ideals of formative assessment, which emphasise the promotion of learning a key objective of assessment (see Atjonen 2014), and they resemble the Pro-Formative group of Brown's (2008) study and the Teaching and Learning-oriented type of Barnes, Fives, and Dacey (2017). Both Assessment Cautious and Assessment Positives had significantly more prior studies both in education and special education compared to Assessment Criticals.

The Assessment Criticals emphasised the negative dimensions of assessment instead of assessment as a tool for assessing or supporting teaching and learning. Their conceptions are not only negative but also quite one-sided since they disagree with both assessment of learning and assessment for learning. They were in tandem with the 'Assessment as Irrelevant' teacher type reported by Barnes, Fives, and Dacey (2017). Similar to our recent results considering solely special needs teachers (Kyttälä et al. 2021), lower amounts of prior theoretical studies (both studies in education and special education) were typical of the Assessment Critical in the current study. This suggests that their (negative) conceptions may be strongly influenced by their current lack of assessment-related studies and/or negative pre-training assessment-related experiences of assessment. As suggested by Xu and Brown (2016), assessment conceptions include both cognitive and affective dimensions. The affective dimension

consists of previous assessment-related emotional experiences. Previous studies show that personal assessment experiences prior to teacher education play a significant role in structuring one's assessment conceptions (Crossman 2007) and that students with negative assessment-related experiences may form more negative conceptions of assessment than students who do not have similar experiences. These students with critical views are a challenging group in regard to teacher education. Teacher education offers a possibility to shape or reconstruct assessment conceptions (Smith et al. 2014; Xu and He 2019), but conceptions based on negative experiences are more difficult to change (Xu and Brown 2016). Alternatively, it should be noted that assessment-critical views are needed to some extent. Assessment always involves the use of power (Atjonen 2007) and should therefore be viewed critically as well.

Pre-service special needs teachers showed more assessment-oriented conceptions, emphasising both assessment of learning and assessment for learning more than the other pre-service teacher groups, and, based on variable-centred analysis, this difference could not be explained by their longer teaching experience or greater amount of prior studies in education. However, this difference may be explained by their greater amount of prior studies in special education, supporting the notion that the contents in special education studies support the formation of assessment-oriented conceptions. This is supported by the person-centred analysis showing that half of this pre-service teacher group represented Assessment Positives, which was more than among the other pre-service teacher groups. Only 10% of them belonged to Assessment Criticals, which was apparently less than among the other groups, in which nearly quarter of the pre-service teachers represented this particular conception profile. These assessment-oriented conceptions are likely to be explained by the fact that special needs teachers' work has traditionally been associated with a wide range of assessment-related tasks (Takala, Pirttimaa, and Törmänen 2009; Takala et al. 2018), which is further reflected in studies and professional expectations.

Compared to pre-service special needs teachers, pre-service classroom and subject teachers seem to represent a more uniform group in terms of assessment conceptions and background factors (age, prior studies, teaching experience), showing a less assessment-oriented view than pre-service special needs teachers. However, even though pre-service classroom teachers and subject teachers, on average, showed less assessment-oriented conceptions than pre-service special needs teachers, person-centred analysis suggested that there were also students with assessment-positive, and thus assessment-oriented, views among them. Similarly, pre-service teachers with assessment-critical conceptions were present across all teacher groups. This is in concordance with the results of Fulmer, Tan, and Lee (2019), who observed that assessment-critical views were present across all secondary school subject teacher groups.

Person-centred analysis also suggested that despite the uniform appearance, there were subtle differences between pre-service classroom and subject teachers as well. Pre-service classroom teachers were slightly more often represented among Assessment Positives and slightly less often represented among Assessment Critical compared to pre-service subject teachers. While altogether 74% of pre-service subject teachers belonged to either Assessment Cautious, showing very traditional conceptions, or to Assessment Criticals, showing negative conceptions, the corresponding ratio was 67% among classroom teachers. Although the difference is not prominent, the results are in line with those

of Remesal (2007) suggesting that secondary school teachers place more emphasis on accountability views and less on pedagogical views when compared with primary school teachers. In Finland, subject teachers work mostly (but not always) at the secondary level or higher and are thus preparing for a different working context than pre-service classroom teachers. The traditional, assessment-cautious conceptions or critical conceptions may reflect the fact that many of them will be responsible for significant summative assessments in the future. Based on the final assessments at the end of lower secondary school and upper secondary school, students will be selected for further studies. These professional assessment-related expectations may direct the assessment conceptions of pre-service subject teachers (see Mockler 2011).

There are certain limitations that should be acknowledged. First, as often is the case in survey studies, participation was voluntary and thus based on participants' motivation. Therefore, the generalisability of the results and reservations on assessment conceptions of those who decided not to respond may be considered an issue. Unfortunately, the exact response rate was not available since the link to the questionnaire was shared on Moodle platforms that were also available to students not our target group. Second, our sample size was rather small in each group of pre-service teachers. More extensive data would have enabled a more sophisticated analysis of both between-group and within-group differences in key variables.

Conclusion

This study extends prior knowledge by providing information about the assessment conceptions of different pre-service teacher groups. Our results show that pre-service teachers who share the same improvement-oriented, unstandardised, low-stakes national assessment context have different assessment conceptions. There are both between-teacher-group differences as well as within-teacher-group differences, suggesting that in every pre-service teacher group, regardless of target qualification, the existing assessment conceptions are heterogeneous and vary from assessment-oriented and formatively oriented to more traditional, summatively oriented or even anti-assessment-oriented. However, there are also significant differences between different pre-service teacher groups, which are related to prior studies and professional expectations.

The national three-tiered support framework requires more of an assessment-oriented approach from all teachers than before. To properly implement the three-tiered support system, the teachers would be required to make decisions on how to assess students' skills, what type of instruction to apply and, further, how long to give instruction before making a decision on whether to move the student to the next tier of support, whether the support needs to be modified or whether the student does not need further separate support. Since municipalities, schools and teachers have a relatively broad autonomy in interpreting the law and national guidelines in Finland, the orientations and decisions of individual teachers become more relevant. This also challenges teacher education since it should provide students with adequate skills for this situation. A relevant part of these assessment skills are students' assessment conceptions, which, based on the present study, seem to vary by prior studies and target qualification. We do not suggest that all teachers should be carved out of the same type of lumber as variation among teachers is

also needed for schools to reflect actual society. Instead, more open discussions about assessment are needed to foster equality between all types of students. Learning and participation is for all students, and supportive assessment is one way to ensure that. The three-tiered support system is also based on multiprofessional collaboration, which requires a shared understanding of, for example, the tasks and objectives of assessment. Supporting this shared understanding of assessment should be an important goal of all teacher education programmes. In practice, this means that assessment should be closely integrated into all courses and practical periods during teacher education, not just in separate assessment courses. The studies should also provide concrete possibilities for different pre-service teacher groups to collaborate.

In conclusion, since assessment is intertwined with the work of teachers in many ways, one of the key aims of teacher education is to support the development of adequate assessment skills. The results of this study show that pre-service teachers have diverse starting points for professional growth related to assessment. When planning curricula for teacher education, it is important to keep in mind that pre-service teachers come to study from distinctive backgrounds and that this affects their professional growth during their studies.

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References

- Arter, J. A. 2003. "Assessment for Learning: Classroom Assessment to Improve Student Achievement and Well-Being." In *Measuring Up: Assessment Issues for Teachers, Counselors, and Administrators*, edited by J. E. Wall and G. R. Walz, 463–484. Greensboro: ERIC.
- Atjonen, P. 2007. "Eettinen näkökulma arviointiin: Miten ja kenen hyvää etsitään?." *Didacta Varia* 12: 31–41.
- Atjonen, P. 2014. "Teachers' Views of Their Assessment Practice." *The Curriculum Journal* 25: 238–259. doi:10.1080/09585176.2013.874952.
- Barnes, N., H. Fives, and C. M. Dacey. 2014. "Teachers' Beliefs about Assessment." In *International Handbook of Research on Teachers' Beliefs*, edited by H. Fives and M. G. Gill, 284–300. London: Routledge.
- Barnes, N., H. Fives, and C. M. Dacey. 2017. "U.S. Teachers' Conceptions of the Purposes of Assessment." *Teaching and Teacher Education* 65: 107–116. doi:10.1016/j.tate.2017.02.017.
- Björn, P. M., M. Aro, M. T. Koponen, L. S. Fuchs, and D. Fuchs. 2016. "The Many Faces of Special Education within RTI Frameworks in the United States and Finland." *Learning Disability Quarterly* 39 (1): 58–66. doi:10.1177/0731948715594787.073194787.
- Björn, P. M., M. Aro, T. Koponen, L. S. Fuchs, and D. Fuchs. 2018. "Response-to-intervention in Finland and the United States: Mathematics Learning Support as an Example." *Frontiers in Psychology* 9: 800. doi:10.3389/fpsyg.2018.00800.
- Black, P., and D. William. 1998. "Assessment and Classroom Learning." *Assessment in Education: Principles, Policy & Practice* 5 (1): 7–74.
- Black, P., and D. William. 2018. "Classroom Assessment and Pedagogy." *Assessment in Education: Principles, Policy & Practice* 25 (6): 551–575.
- Bollen, K. A. 1989. *Structural Equations with Latent Variables*. New York, NY: John Wiley & Sons.
- Brown, G. T. L. 2004. "Teachers' Conceptions of Assessment: Implications for Policy and Professional Development." *Assessment in Education* 11: 302–318.
- Brown, G. T. L. 2008. *Conceptions of Assessment: Understanding What Assessment Means to Teachers and Students*. New York: Nova Science Publishers.
- Brown, G., A. Gebril, and M. Michaelides. 2019. "Teachers' Conceptions of Assessment: A Global Phenomenon or A Global Localism." *Frontiers in Education* 4. doi:10.3389/feduc.2019.00016.
- Brown, G. T. L., S. K. F. Hui, F. W. M. Yu, and K. J. Kennedy. 2011. "Teachers' Conceptions of Assessment in Chinese Contexts: A Tripartite Model of Accountability, Improvement, and Irrelevance." *International Journal of Educational Research* 50 (5–6): 307–320. doi:10.1016/j.ijer.2011.10.003.
- Brown, G. T. L., and A. Remesal. 2012. "Prospective Teachers' Conceptions of Assessment: A Cross-cultural Comparison." *The Spanish Journal of Psychology* 15 (1): 75–89.
- Coutts, R. A., W. L. Gilleard, and R. Baglin. 2011. "Evidence for the Impact of Assessment on Mood and Motivation in First-year Students." *Studies in Higher Education* 36 (3): 291–300.

- Crossman, J. 2004. "Factors Influencing the Assessment Perceptions of Training Teachers." *International Education Journal* 5 (4): 582–590.
- Crossman, J. 2007. "The Role of Relationships and Emotions in Student Perceptions of Learning and Assessment." *Higher Education Research and Development* 26: 313–327.
- Daniels, L. M., and C. A. Poth. 2017. "Relationships between Pre-service Teachers' Conceptions of Assessment, Approaches to Instruction, and Assessment: An Achievement Goal Theory Perspective." *Educational Psychology* 37 (7): 835–853. doi:10.1080/01443410.2017.1293800.
- Deneen, C. C., and G. T. L. Brown. 2016. "The Impact of Conceptions of Assessment on Assessment Literacy in a Teacher Education Program." *Cogent Education* 3 (1): 1225380.
- Deneen, C. G., G. W. Fulmer, G. T. L. Brown, K. Tan, W. S. Leong, and H. Y. Tay. 2019. "Value, Practice and Proficiency: Teachers' Complex Relationship with Assessment for Learning." *Teaching and Teacher Education* 80: 39–47. doi:10.1016/j.tate.2018.12.022.
- Frey, B. B., and V. L. Schmitt. 2007. "Coming to Terms with Classroom Assessment." *Journal of Advanced Academics* 18: 402–423. doi:10.4219/jaa-2007-495.
- Fuchs, D., and L. S. Fuchs. 2005. "Responsiveness-to-intervention: A Blueprint for Practitioners, Policymakers and Parents." *Teaching Exceptional Children* 38 (1): 57–61.
- Fulmer, G. W., K. H. K. Tan, and I. C. H. Lee. 2019. "Relationships among Singaporean Secondary Teachers' Conceptions of Assessment and School and Policy Contextual Factors." *Assessment in Education: Principles, Policy & Practice* 26 (2): 166–183. doi:10.1080/0969594X.2017.1336427.
- Gibbs, G., and C. Simpson. 2005. "Conditions Under Which Assessment Supports Students' Learning." *Learning and Teaching in Higher Education* 1: 3–31.
- Gore, P. A. 2000. "Cluster Analysis." In *Handbook of Applied Multivariate Statistics and Mathematical Modeling*, edited by H. E. A. Tinsley and S. D. Brown, 297–321. San Diego: Academic Press. doi:10.1016/B978-012691360-6/50012-4.
- Gott, R., and S. Duggan. 2002. "Problems with the Assessment of Performance in Practical Science: Which Way Now?" *Cambridge Journal of Education* 32 (2): 183–201. doi:10.1080/03057640220147540.
- Grigorenko, E. L. 2009. "Dynamic Assessment and Response to Intervention: Two Sides of One Coin." *Journal of Learning Disabilities* 42: 111–132. doi:10.1177/0022219408326207.
- Halinen, K., M. Ruohoniemi, N. Katajavuori, and V. Virtanen. 2014. "Life Science Teachers' Discourse on Assessment: A Valuable Insight into the Variable Conceptions of Assessment in Higher Education." *Journal of Biological Education* 48 (1): 16–22. doi:10.1080/00219266.2013.799082.
- Harlen, W. 2005. "Teachers' Summative Practices and Assessment for Learning – Tensions and Synergies." *Curriculum Journal* 16 (2): 207–223. doi:10.1080/09585170500136093.
- Hawe, E. 2007. "Student Teachers' Discourse on Assessment: Form and Substance." *Teaching in Higher Education* 12 (3): 323–335. doi:10.1080/13562510701278666.
- Hill, M. F., and G. Evers. 2016. "Moving from Student to Teacher: Changing Perspectives about Assessment through Teacher Education." In *Handbook of Human and Social Conditions in Assessment*, edited by G. T. L. Brown and L. R. Harris, 103–128. New York, NY: Routledge.
- Honkala, S., and T. Komppa. 2020. "Esi- Ja Perusopetuksen Opettajat [Teachers in Preschool and Compulsory Education]." In *Opettajat Ja Rehtorit Suomessa 2019 [Teachers and Principals in Finland 2019]*, edited by Opetushallitus, 7–27. Helsinki: OPH.
- Hooper, D., J. Coughlan, and M. R. Mullen. 2008. "Structural Equation Modelling: Guidelines for Determining Model Fit." *The Electronic Journal of Business Research Methods* 6 (1): 53–60.
- Howard, M. C., and M. E. Hoffman. 2018. "Variable-Centered, Person-Centered, and Person-Specific Approaches: Where Theory Meets the Method." *Organizational Research Methods* 21 (4): 846–876. doi:10.1177/1094428117744021.
- Jiawei, H., M. Kamber, and J. Pei 2011. "Data Mining: Concepts and Techniques." Elsevier Science & Technology, ProQuest Ebook Central. Amsterdam: Elsevier. <https://ebookcentral.proquest.com/lib/kutu/detail.action?docID=729031>

- Kyttälä, M., P. Björn, M. Rantamäki, V. Närhi, and M. Aro. 2021. "Assessment Conception Patterns of Finnish Pre-Service Special Needs Teachers: The Contribution of Prior Studies and Teaching Experience." *European Journal of Special Needs Education*. doi:10.1080/08856257.2020.1853972.
- Levy-Vered, A., and F. N.-A. Alhija. 2018. "The Power of a Basic Assessment Course in Changing Preservice Teachers' Conceptions of Assessment." *Studies in Educational Evaluation* 59: 84–93. doi:10.1016/j.stueduc.2018.04.003.
- Lutovac, S., and M. A. Flores. 2021. "Conceptions of Assessment in Pre-service Teachers' Narratives of Students' Failure." *Cambridge Journal of Education*. doi:10.1080/0305764X.2021.1935736.
- Mockler, N. 2011. "Beyond 'What Works': Understanding Teacher Identity as a Practical and Political Tool." *Teachers and Teaching* 17 (5): 517–528. doi:10.1080/13540602.2011.602059.
- OECD. 2019. "What Students Know and Can Do." *PISA 2018 Results I*. doi:10.1787/5f07c754-en.
- Postareff, L., V. Virtanen, N. Katajajuuri, and S. Lindblom-Ylänne. 2012. "Academics' Conceptions of Assessment and Their Assessment Practices." *Studies in Educational Evaluation* 38: 84–92.
- Remesal, A. 2007. "Educational Reform and Primary and Secondary Teachers' Conceptions of Assessment: The Spanish Instance, Building upon Black and Wiliam (2005)." *Curriculum Journal (London, England)* 18.1: 27–38.
- Remesal, A. 2011. "Primary and Secondary Teachers' Conceptions of Assessment: A Qualitative Study." *Teaching and Teacher Education* 27: 472–482.
- Siegel, M. A., and C. Wissehr. 2011. "Preparing for the Plunge: Pre-service Teachers' Assessment Literacy." *Journal of Science Teacher Education* 22 (4): 371–391. doi:10.1007/s10972-011-9231-6.
- Smith, L. F., M. F. Hill, B. Cowie, and A. Gilmore. 2014. "Preparing Teachers to Use the Enabling Power of Assessment." In *Designing Assessment for Quality Learning. The Enabling Power of Assessment*, edited by C. Wyatt-Smith, V. Klenowski, and P. Colbert, 303–323. Vol. 1. Dordrecht: Springer Science+Business Media.
- Steiger, J. H. 2007. "Understanding the Limitations of Global Fit Assessment in Structural Equation Modeling." *Personality and Individual Differences* 42 (5): 893–898.
- Takala, M., R. Piirtimaa, and M. Törmänen. 2009. "Inclusive Special Education: The Role of Special Education Teachers in Finland." *British Journal of Special Education* 36: 162–172.
- Takala, M., E. Silfver, Y. Karlsson, and M. Saarinen. 2018. "Supporting Pupils in Finnish and Swedish Schools —teachers' Views." *Scandinavian Journal of Educational Research*. doi:10.1080/00313831.2018.1541820.
- TENK. 2019. The ethical principles of research with human participants and ethical review in the human sciences in Finland. Finnish National Board on Research Integrity TENK guidelines. 2019. *Tutkimuseettisen neuvottelukunnan julkaisu 3*. Helsinki: Finnish National Board on Research Integrity TENK.
- Vainikainen, M. P., H. Thuneberg, J. Marjanen, J. Hautamäki, S. Kupiainen, and R. Hotulainen. 2017. "How Do Finns Know? Educational Monitoring without Inspection and Standard Setting." In *Standard Setting in Education. Methodology of Educational Measurement and Assessment*, edited by S. Blömeke and J. E. Gustafsson. Cham: Springer, 243–259. doi:10.1007/978-3-319-50856-6_14.
- Veldhuis, M., and M. van den Heuvel-panhuizen. 2013. "Primary School Teachers' Assessment Profiles in Mathematics Education." *PLOS One* 9: 1. doi:10.1371/journal.pone.0086817.
- Virinkoski, R., M.-K. Lerkkanen, K. Eklund, and M. Aro. 2020. "Special Education Teachers' Identification of Students' Reading Difficulties in Grade 6." *Scandinavian Journal of Educational Research*. doi:10.1080/00313831.2020.1833241.
- West, S. G., A. B. Taylor, and W. Wu. 2012. "Model Fit and Model Selection in Structural Equation Modeling." In *Handbook of Structural Equation Modeling*, edited by R. H. Hoyle, 209–231. New York, NY: Guilford Press.
- Xu, Y., and G. T. L. Brown. 2016. "Teacher Assessment Literacy in Practice: A Reconceptualization." *Teaching and Teacher Education* 58: 149–162. doi:10.1016/j.tate.2016.05.010.
- Xu, Y., and L. He. 2019. "How Pre-service Teachers' Conceptions of Assessment Change over Practicum: Implications for Teacher Assessment Literacy." *Frontiers in Education* 4: 1–16. doi:10.3389/educ.2019.00145.