Studies in Educational Evaluation 71 (2021) 101094

Contents lists available at ScienceDirect

Studies in Educational Evaluation

journal homepage: www.elsevier.com/locate/stueduc

A scoping review on the notions of Assessment as Learning (AaL), Assessment for Learning (AfL), and Assessment of Learning (AoL)

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ARTICLE INFO

Keywords:
Assessment as Learning (AaL)
Assessment for Learning (AfL)
Assessment of Learning (AoL)
Scoping review

ABSTRACT

Associations between assessment and learning are widely studied and often organized around the notions of Assessment *as* Learning (AaL), Assessment *for* Learning (AfL), and Assessment *of* Learning (AoL). Although these notions are appealing in theory, the notions are unclear constructs to comprehend, as both their definitions and their practice are used inconsistently in educational research. We present a synthesis of common characteristics among these notions, based on a scoping review on definitions and descriptions of AaL, AfL, and AoL (131 studies). The synthesis of common characteristics consists of nine themes that refer to how educational assessment relates to learning. The themes are grouped into: 1) Student-teacher roles and relationships within assessment; 2) Assessment learning environment; and 3) Educational outcomes of assessment. Then, we used the themes within the synthesis to analyze the results of the included empirical studies on their contributions to practice (84 studies). The synthesis provides stakeholders with a clear and integrative view of how educational assessment relates to learning and may be beneficial to educators to support and design their assessment practices. We argue that the notions of AaL, AfL, and AoL should be seen in coherence with one another in order to establish an assessment culture that facilitates students' learning maximally.

1. Introduction

Assessment has a major impact on students' learning. Assessment influences what students regard as important; it affects students' understanding of learning tasks and impacts the quality of students' involvement in these tasks; and it influences the transfer of these insights to future learning (e.g. Boud & Falchikov, 2006; Gibbs & Simpson, 2005; Rust, 2002). The results of an empirical study by Cilliers, Schuwirth, Herman, Adendorff, and van der Vleuten (2012) provide insight into how both assessment tasks and the assessment system as a whole can act as sources of impact on students' learning. In this study, task demands (i.e., task type and assessment criteria) and the design of the assessment system (i.e., prevailing workload and patterns of scheduling) influenced the nature of students' cognitive processing activities and students' metacognitive regulation activities. The process of regulation, such as goal setting, monitoring progress and adjustment of actions towards a goal, has been found to be a central feature of learning (e.g. Allal, 2010; Panadero, Andrade, & Brookhart, 2018).

Because of the importance of assessment in relation to learning, associations between assessment and learning are widely studied, resulting in a growing body of research about assessment that impacts learning. Over the last 30 years, the terminology used to describe educational assessment and its association with learning has evolved (*Crooks, 2011). Since 1990, the terms formative assessment and summative assessment have been widely used. In general, two distinct purposes are assigned to these notions: 1) assessments with a formative function serve the support and improvement of students' learning, while 2) assessments with a summative function serve the purposes of accountability, ranking, or certifying competence by the judgement of students' achievement (e.g. Black, Harrison, Lee, Marshall, & Wiliam, 2004). In 1999, the Assessment Reform Group (ARG), an influential group of educational researchers within the UK, chose alternative terms for the formative and summative functions of assessment to communicate more clearly the learning aspect (ARG, 1999). Assessment with a

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https://doi.org/10.1016/j.stueduc.2021.101094
Received 2 February 2021; Received in revised form 22 July 2021; Accepted 7 October 2021
Available online 20 October 2021

formative function became Assessment for Learning (AfL), which in general emphasized the purpose of assessment to improve the learning and teaching process. Assessment with a summative function became Assessment of Learning (AoL), which in general was used to judge performance and measuring outcomes after a formal learning activity (e.g. ARG, 1999; *Crooks, 2011; Earl, 2003).

In 2002, ARG provided the following definition of AfL: "Assessment for Learning is the process of seeking and interpreting evidence for use by learners and their teachers to decide where the learners are in their learning, where they need to go and how best to get there" (ARG, 2002, 1–2). The definition contributed to the notion of closing the learning gap, by monitoring student progress in comparison with reference levels of standards and continuous feedback (*Ninomiya, 2016). However, scholars also argued that the definition could result in practices wherein teachers frequently tested their students to assess the levels they attained against prescribed standards (e.g. Klenowski, 2009). Therefore, in 2009 a second-generation definition of AfL was adopted to make clear that the central focus is on learning, with students and teachers as key agents in this process: "Assessment for Learning is part of everyday practice by students, teachers and peers that seeks, reflects upon and responds to information from dialogue, demonstration and observation in ways that enhance ongoing learning" (Klenowski, 2009, 264).

In 2003, Earl (2003, 2013) added a third notion, denoted as Assessment as Learning (AaL). This notion includes the active involvement of students in self-assessment and self-directed learning as a distinct function to improve the learning process. Earl's intention was to extend the role of AfL by emphasizing the role of the student as the critical connector between the assessment and learning process (*Dann, 2014; Earl & Katz, 2008). In this view, the student is seen as being an active and engaged assessor in order to support the development of metacognitive and self-regulated learning skills (Earl, 2013; *Lam, 2016). Some scholars argue that AaL can generally be considered as a subsection of AfL (Clark, 2012; Earl, 2013; *Lam, 2018). Others suggest that the practice of AaL represents the final phase of a developmental continuum for improving assessment practice (Tomlinson, 2007). Another perspective is that AaL, AfL and AoL should be seen as integrated entities in coherence with the entire education model in order to facilitate learning maximally (Van der Vleuten, Sluijsmans, & Joosten-Ten Brinke, 2017). Moreover, the notion of AaL is also subject to criticism in the literature (*Fletcher, 2016). *Torrance (2007, 281) refers to AaL as a concept of "procedural compliance", in which assessment procedures and practices dominate students' learning experiences, resulting in student achievement without understanding. Hence, although AaL was originally considered in conjunction with AfL, various meanings exist.

1.1. Problem definition and research questions

The assessment notions AaL, AfL, and AoL reflect different and valuable assessment and learning approaches. In general, AaL represents the active engagement of students in assessment and their learning, AfL represents the identification of learning throughout assessment, and AoL represents the measurement of learning by using assessments (Berry, 2013; *Birenbaum et al., 2015; *Sadeghi & Rahmati, 2017). However, as interest in AaL and AfL has increased over the years, the various definitions of AaL and AfL emphasize different aspects of how assessment relates to learning and are used interchangeably (*McDowell, Wakelin, Montgomery, & King, 2011; *Swaffield, 2011). For example, more recent definitions of AfL emphasize the active role of the teacher and students in the assessment process, while the same characteristics are central in the definition of AaL. Because of the breadth of definitions and the diversity in educational contexts, the notions of AaL, AfL, and AoL are not straightforward to comprehend (*Baird, Andrich, Hopfenbeck, & Stobart, 2017; *Tan, 2017). Consequently, teachers may not clearly understand how assessment should be practised to enhance learning (*Tan, 2017; *Tunku Ahmad et al., 2014). The diversity in definitions and contexts also means that the efficacy of the assessment practices is difficult to research and document (Bennett, 2011; Dunn & Mulvenon, 2009). To regard educational assessment as an overarching coherent construct it is relevant to understand the underlying notions and how they relate to each other conceptually. The current review aims to provide insight into this issue by systematically reviewing definitions and descriptions of AaL, AfL, and AoL in order to synthesize common characteristics of the assessment notions that refer to student learning. Then, we use the common characteristics as a framework to examine the results of the included empirical studies for their contributions to practice. The following research questions were formulated:

1) What are common characteristics of the definitions and/or descriptions of AaL, AfL, and AoL?
2) What is known about the common characteristics of the assessment notions from findings of the included empirical studies?

1.2. Previous reviews on AaL, AfL and AoL

In two review studies, the notion of AfL (*Wiliam, 2011), and both AfL and AaL (Clark, 2012) are described in relation to the notion of Formative Assessment (FA). *Wiliam (2011) discussed different definitions of the terms FA and AfL and distinguished two requirements of assessment to support learning: 1) the assessment provides information to lead to improved performance; and 2) the assessment engages the learner in actions to improve learning. Clark's (2012) review included 199 studies and focused on the theories and goals of FA in function of the promotion of students' self-regulatory learning strategies. One review study had a specific focus on the notion of AaL (*Lam, 2016) and one on the notion of AfL (*Heitink, van der Kleij, Veldkamp, Schildkamp, & Kippers, 2016). *Lam (2016) reviewed the extent to which AaL supports writing instruction and student learning in higher education. *Heitink et al. (2016) conducted a literature review to reveal the prerequisites for implementation of AfL. Although review studies have been conducted on the assessment notions AaL and/or AfL, these reviews do not provide a synthesis of the common characteristics of the three assessment notions in the last two decades of educational research, nor do they review how the common characteristics are practiced. In addition, some reviews were set up in the form of a critical analysis and did not report on features of systematic research reviews, such as conducting a systematic search of the literature or applying inclusion criteria, or did not include all educational sectors.

1.3. Relevance

The aim of the paper is to develop a synthesis of the assessment notions AaL, AfL, AoL on common characteristics and to examine how these common characteristics are empirically practiced. We do so by means of a scoping review. Rather than viewing the three notions of assessment as distinct, we chose to review these definitions alongside one another to prevent a fragmented picture. A common language that relates assessment to learning is a prerequisite to establish an assessment culture that supports the development of students as learners (Medland, 2016). The resulting synthesis we provide can support teachers, faculty development programmes, and institutions to improve their assessment tools, assessment practices, and assessment programs. Next, the analysis of the included empirical studies on these common characteristics, contributes to a more coherent understanding of the research on AaL, AfL, and AoL that has been conducted in the past two decades at various educational sectors.

2. Methods

2.1. Scoping review

The purpose of a scoping review is to clarify complex concepts and

identify key concepts and gaps in existing literature (Daudt, van Mossel, & Scott, 2013; Levac, Colquhoun, & O'Brien, 2010). Scoping reviews, as opposed to systematic reviews, tend to create an overview of a diverse body of work, regardless of methodological approaches (Pham et al., 2014). The procedure for this scoping review was based on the six-stage methodological framework developed by Arksey and O'Malley (2005). The framework enables replication of the search strategy and increase the reliability of the study findings (Pham et al., 2014). The framework includes the following stages: 1) identifying the research question; 2) identifying relevant studies; 3) selecting studies; 4) charting the data; 5) collating, summarizing and reporting the results; and 6) consulting with stakeholders to validate study findings. The first stage, the identification of the research questions, has been described in the introduction section. The last stage was applied during the course of the whole review process by consulting the research team at each stage and will not be presented separately. Stages 2–5 are elaborated in the next sections.

2.2. Stage 2: identifying relevant studies

We conducted a systematic search for English peer reviewed articles published between 1999 and 2018. We searched in ERIC, PsycINFO, PubMed and Web of Science databases to find educational research published in the disciplines of social and behavioural sciences, humanities and medicine. We chose 1999 as the year of reference because of the introduction of the notion of AfL around that time. Although a diversity of literature is permitted in scoping reviews, we put restrictions on the type by only including research articles. In addition, because a scoping review does not require an appraisal of the quality of the literature as no methodological restrictions are enforced, we chose to include only peer reviewed articles to impose a kind of quality appraisal. A librarian was consulted to verify the search strategies. The following keywords were used to search in titles or headings and abstracts: 'assessment as learning' or AaL; 'assessment for learning' or AfL; 'assessment of learning' or AoL. We thus chose not to use terminology or synonyms that were related to the notions of assessment (e.g., formative assessment or self-regulated learning), because our aim was not to classify related concepts. After electronic searches, searches were conducted using the Google Scholar search engine, and a snowball method was undertaken by inspecting the reference lists of the included articles.

2.3. Stage 3: selecting studies

The first search resulted in 599 articles that were imported in RefWorks software to detect exact match duplicates: 135 duplicates were found, resulting in a total of 464 articles to include for selection based on title and abstract. The first author screened articles on title and abstract. When the title or abstract matched the first two inclusion criteria, the article was included for full text screening which was conducted by three authors (LS, HB and LdJ). Studies were included when:

1) The text was a scientific research article written in English.
2) The article focused on learning through assessment to promote students' learning in a regular physical educational context.
3) A description or definition was given of AaL and/or AfL and/or AoL.

See Appendix A for a more thorough description of the inclusion and exclusion criteria.

Of the 464 studies, a total of 290 were excluded based on screening of title and abstract, resulting in 174 articles for selection based on full text screening. A random sample of 15 per cent was screened by three authors. Each author rated 26 articles and a generalized Kappa statistic for use with multiple raters was calculated, yielding an acceptable kappa coefficient of 0.79. Any discrepancies between the authors were discussed until consensus was reached. The first author screened the remaining articles, resulting in 118 included articles. Finally, a total of 34 studies were found in the second search strategy and screened on the original inclusion criteria, which resulted in 13 additional studies. In Fig. 1, a PRISMA flow diagram reports the flow of the articles included in this review (Moher, Liberati, Tetzlaff, Altman, & Grp, 2009).

2.4. Stage 4: charting the data

The first author developed a coding template for data extraction, which was discussed with the whole research team. To include the richness of the data, we decided to use the coding template to record descriptive information only (authors' names, year of publication, aim, study design, country, sector, discipline, participants). Three authors coded 13 articles (10 % of the total sample) and discussed text fragments intensively to agree upon fragments that signified definitions or descriptions of the notions of assessment (research question 1) and that indicated the results of empirical studies (research question 2). Next, the first author read the 131 included studies and uploaded all articles in NVivo11 Pro for Windows. Text fragments that defined the assessment notions were highlighted as nodes (see Appendix B1). Many articles provided more than one definition of the assessment notion(s), resulting in 569 unique nodes for definitions and descriptions of AaL (n = 85), AfL (n = 451), and AoL (n = 33). To investigate common characteristics of the descriptions, we considered the three assessment notions as a joint unit of analysis by merging the descriptions of all three notions into one unit. We opted for a joint unit of analysis for two reasons. Firstly, to rule out that the descriptions of the assessment notions in the included studies were possibly biased by erroneous understandings of the assessment construct by the author, since terminology may improperly be used interchangeably (e.g. *Swaffield, 2011). Secondly, to enhance our understanding of how assessment relates to learning we aimed to attain a broad portrayal of this association (Elo & Kyngäs, 2008). To examine the nodes of text fragments that defined and described the notions AaL, AfL, and AoL as a joint unit of analysis, all text that referred to a particular notion was replaced by the term 'assessment' (see Appendix B2 for an example). Similarly, in some definitions of the assessment notions referrals to concepts like formative or summative assessment were made. These descriptions were also replaced by the term 'assessment' to avoid classification in existing assessment constructs. Then, the text fragments of all nodes were coded using an inductive content analysis approach (Elo & Kyngäs, 2008). First, we densely coded the content of each node because every single node could contain several pieces of information (i.e., codes), depending on the richness of the description or definition of the assessment notion (Cohen, Manion, & Morrison, 2018). Consequently, one node could contain several codes (see Appendix B3 for an example). The same code was given to a text fragment, when the text shared the same type of content. The names of the codes were chosen inductively by the first three authors, based on the content and words used in the text fragments to bear resemblance to the original data (Cohen et al., 2018). To ensure consistency and coverage of the codes, text fragments of the nodes were re-read and codes were re-assigned several times. A code was specified when at least two (parts of) text fragments referred to the same content. A total of 72 codes emerged from the analysis of the nodes. Although some codes were more frequently used than others (e.g., 'practice involves feedback' was coded 95 times, while 'students are passive' was coded two times), only the content of the code was taken into account to group the codes into themes. In an iterative process with the whole team, the codes were examined, compared, and conceptualized on their content in order to categorize the codes into themes until consensus was reached (see Appendix B4). The classification of the codes into themes resulted in nine themes. Text fragments of the codes that were assigned to a theme were used to describe the themes in the results section. Appendix C provides an overview of the codes that were allocated to the themes.

To answer the second research question, only empirical studies were included (n = 84). To include findings of both quantitative and qualitative studies, we converted all empirical results into a qualitative form

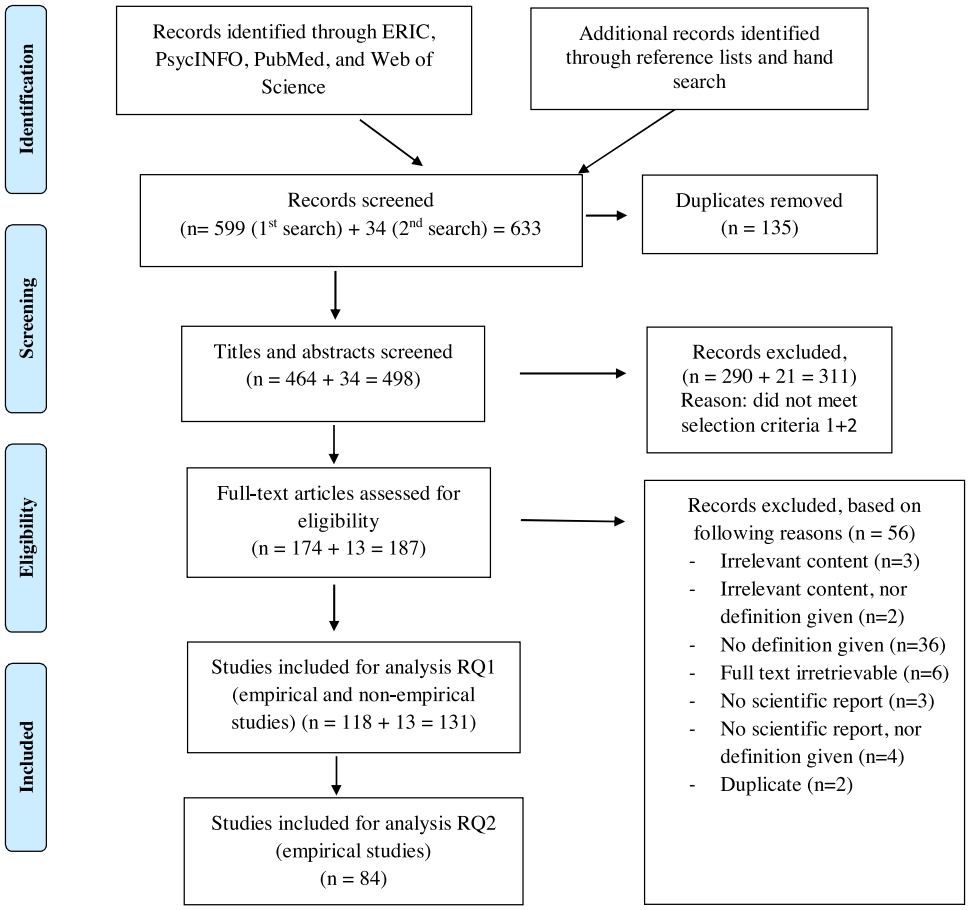

Fig. 1. PRISMA Flow Diagram (Moher et al., 2009).

by formulating a summary phrase that depicted the findings of the study (Dixon-Woods, Agarwal, Jones, Young, & Sutton, 2005; Van Leeuwen & Janssen, 2019). For each published result in the results section of a particular study, a summary phrase was formulated in alignment with the aim(s) or research question(s) of the empirical study (see Appendix B5). A study could yield multiple summary phrases. The results of three empirical studies were not applicable to include because no results section was included, or because the published results did not match the aim or research question of the study. The 81 empirical studies included generated 221 summary phrases (mean = 2.7 per study). Summary phrases of nine studies (42 phrases) were checked and discussed for accuracy and formulation of the phrases by the third author until consensus was reached. Finally, all summary phrases were thematically analysed for the outcomes of research question 1 (Dixon-Woods et al., 2005). To assign a summary phrase to a theme, we first classified the subject or outcome of the summary phrase. For example, whether the results related to the teacher's skills, practices, perceptions, or (assessment) knowledge/professionalisation; to the student's skills, perceptions, or (assessment) knowledge; to the teacher and student interaction/relationships; to the learning environment; or to the outcomes of assessment; or other. We then further examined each summary phrase with regard to what processes or objects were studied to classify the result into a subtheme. We assigned a result to a theme when the subject matched the description of the codes that formed the theme. Consequently, the results that are reported within a theme, may have a broader scope than the theme itself. For example, the theme 'teachers adapt to students' needs' includes results that reported outcomes with regard to teacher's practices, teachers' skills, and teacher's perceptions towards assessment because the teacher is central in both the outcome of the study and in the description of the theme. In a few cases that the summary phrase overlapped with more than one theme, findings were discussed by the authors (LS and LdJ) until consensus was reached. For example, when the result related to 'feedback' we discussed whether feedback was reported as an instructional tool to inform learning and teaching (to assign this result to the theme 'use various sources of information to act upon) or whether feedback was reported, for example, as a teacher skill (to assign the result to 'teachers adapt to students' needs').

3. Results

3.1. Descriptive analysis of the literature

A total of 131 articles were included in this review. The majority of the studies were conducted in Europe (n = 58, 44.2 %). The remainder of the articles were written by authors from Asia (n = 25, 19.1 %), North America (n = 20, 15.3 %), Australia and New Zealand (n = 15, 11.5 %), or by authors from other, or a mix of countries (n = 13, 9.9 %). With regard to the educational sector that was researched, an almost even distribution was found across primary schools (28.7 %), secondary schools (23.8 %), and higher education (26.7 %). The sector of vocational education was underrepresented in the sample (2.0 %). Various studies included more than one sector in their sample (18.8 %). Empirical research was conducted in 84 (64.1 %) studies. The remaining studies were classified as conceptual (n = 47) and contained theoretical or discussion studies (n = 43) or they were review studies (n = 4). The majority of the studies included reported research related to the notion of AfL (n = 109, 83.2 %). The notion of AaL was the subject in nine studies (6.9 %), and one study reported findings related to the notion of AoL (0.8 %). In 12 (9.2 %) studies the subject of the research contained

two or three assessment notions.

3.2. Overview themes how assessment relates to learning and its empirical support

The synthesis of common characteristics identified nine themes, based on the inductive analysis of definitions of the three assessment notions. The themes refer to *common* characteristics of how assessment relates to learning. We do not intend that the three assessment notions are covered in all themes or that the three notions are equal to each other. The synthesis represents assessment practices that generally matter in relation to student learning. For readability we will use the term 'educational assessment' as an overall umbrella term that includes the synthesis of common characteristics of AaL, AfL, and AoL. Assessment can be defined as "a wide range of methods for evaluating student performance and attainment" (Gipps, 2011, p.11). The common characteristics (themes) we found shed light on the range of these methods and emphasize the conditions for successful educational assessment, regardless of whether the method is applied according to purposes of an AaL, AfL, or AoL approach. We grouped the themes into: 1) Student-teacher roles and relationships within assessment; 2) Assessment learning environment; and 3) Educational outcomes of assessment. See Fig. 2 for an overview of the themes.

In the next sections we will elaborate on each theme. Each theme is described in two parts. The first paragraph contains a description of the theme. The content of the theme's description is generated from the text fragments that described or defined the assessment notions AaL, AfL, and AoL that were assigned to the particular theme (research question 1). The subsequent paragraph(s) contain main findings from the empirical studies that matched the particular theme (research question 2), in order to contribute to a more coherent understanding of the conducted research within the theme in the past two decades within various educational sectors. Full details of the studies, assigned to themes, can be found in Appendix D.

3.3. Student-teacher roles and relationships within assessment

3.3.1. Students are actively involved

Educational assessment refers to students who are actively involved in assessment and in their own learning. Active involvement in assessment is stimulated when practices include the possibility for students to develop the skills to assess themselves and their peers, and when activities of self-assessment (i.e., self-reflection, self-evaluation) and peer assessment are offered within the course to practise these skills. Students are actively involved in learning when they have the opportunity to take responsibility for directing their own learning. For example, by providing activities wherein students can plan, monitor and evaluate their own learning.

Nine empirical studies reported findings with regard to students' involvement in assessment practices. Overall, the majority of students reported very few or no involvement in assessment practices that reflected principles of assessment that support learning, such as the involvement of students in peer- and self-assessment (*DeLuca, Chapman-Chin, LaPointe-McEwan, & Klinger, 2018; *Leirhaug & Annerstedt, 2016). Findings in nine studies were focused on the attitudes students have towards assessment approaches that involves them in assessment and learning. A majority of the students expressed positive attitudes towards such assessments (e.g. *Carless, 2002; *McDowell et al., 2011; *Thompson et al., 2017). Students valued that they became more responsible for their own learning, which, in turn, motivated them to learn. Students reported that sharing success criteria, peer support and teacher feedback were helpful to engage them in their learning, as was being given the opportunity to improve work before the final deadline (e.g. *DeLuca et al., 2018; *McDowell et al., 2011; *Newby & Winterbottom, 2011).

3.3.2. Students and teachers have a collaborative relationship

Educational assessment refers to a collaborative relationship between students and teachers. Students and teachers share roles and responsibilities with each other, reflected by a shift from a teacher-centred towards a more student-centred perspective. The teacher acts as a guide of students' learning processes, and students act as partners instead of being passive recipients of teachers' decisions and actions. Practices provide opportunities to collaborate and to participate in two-way dialogues, negotiations and discussions.

Four studies reported findings about student-teacher relationships and their role in the assessment process. A (temporary) process of co-construction, wherein teachers guide students to develop as autonomous and self-regulated learners, facilitates a more central role of the student as a partner in assessment. Co-construction is supported through

<table>
<tr><th colspan="3">Student-teacher roles and relationships within assessment</th></tr>
<tr><th>Students</th><th>Students and teachers</th><th>Teachers</th></tr>
<tr><td>- Actively involved students (n=9)</td><td>- Collaborative relationship (n=4)
- Use various information sources to act upon (n=6)
- Literate in assessment (n=20)</td><td>- Adapt to students' needs (n=30)</td></tr>
<tr><th colspan="3">Assessment learning environment</th></tr>
<tr><td colspan="3">- Supportive learning environment that engage students (n=8)
- Aligned learning environment at the classroom and the programme level (n=18)</td></tr>
<tr><th colspan="3">Educational outcomes of assessment</th></tr>
<tr><td colspan="3">- Enhance students' learning (n=8)
- Determine the status of learning achievement (n=9)</td></tr>
</table>

Fig. 2. Overview themes of how assessment relates to learning, based on the analysis of definitions and descriptions of AaL, AfL, and AoL.
Note. The number in brackets refer to the empirical studies that reported findings within the theme.

a focus on and guidance about the learning to be achieved, shared ownership and understanding, and a safe and supportive learning environment (*Heritage, 2018; *Willis, 2011). Student-teacher relationships may be influenced by the perceptions that teachers and students hold. For example, with regard to preferences and perceptions of students, it was found that students who held learning goals viewed assessment activities as a joint teacher-student responsibility, while students with performance goals viewed assessment as a teacher's sole responsibility (*Cowie, 2005).

3.3.3. Students and teachers use various sources of information to act upon

Educational assessment refers to a flow of meaningful information about the achievement of learning to inform the teaching and the learning, and to act upon. Students and teachers continuously collect, interpret and reflect on various sources of information to monitor progress and use the information to further learning. Practices include opportunities for practice and rehearsal, appropriate and constructive feedback, and low-stakes assessments. Practices also facilitate the uptake of feedback by connecting information on learning across assessments and/or modules.

Six studies presented findings on the presence of meaningful assessment information to inform the teaching and learning process. These studies were all aimed at feedback as a source of information. Overall, findings indicated that different participants may prefer different types of feedback (e.g. *Colby-Kelly & Turner, 2008; *Hargreaves, 2013). Consequently, students may benefit from multiple types of feedback (*Hargreaves, 2013). As for the uptake of feedback, reasons for students to not use the feedback given to them are: 1) when no opportunity is provided to use the feedback to improve the work, and 2) when the feedback is confusing (e.g., too vague/brief) (*Mumm, Karm, & Remmik, 2016). Regarding the uptake of peer feedback, preconceptions of students concerning their peers may affect the usefulness of peer feedback, because peers may not be sufficiently critical or too stringent, nor trustworthy (*Colby-Kelly & Turner, 2008; *Mumm et al., 2016).

3.3.4. Students and teachers are literate in assessment

Educational assessment refers to both teachers' and students' development to become literate in and familiar with talking about learning and assessment, and their understanding of the assessment process and of what quality looks like. Practices include the development of classroom conversation, sharing and discussing assessment criteria and studying models of strong and weak work in order to communicate about and improve student learning. Twenty studies reported findings on subjects related to teachers' and students' understanding of assessment procedures and concepts, and/or their development to become assessment literate. We grouped these findings into research directed at a) understanding of the assessment notions and their definitions; and b) outcomes of teacher professional development programmes.

a) Understanding of the assessment notions and their definitions

Only one of the included studies examined student perspectives on the clarity of definitions of the assessment notions AaL, AfL, and AoL. Although most students could grasp the concept of AfL, none of the students could provide a complete definition (*Lorente-Catalán & Kirk, 2016). Eleven studies reported findings regarding understanding among teachers. In general, teachers understood the improvement and student-focused purpose of assessment (e.g. *Hui, Brown, & Chan, 2017; *Leirhaug & MacPhail, 2015). However, in most studies, teachers showed poor and varied understandings of the different assessment notions and related practices, indicating no clarity of definition (e.g. *Boyle & Charles, 2010; *Torrance, 2007; *Volante, 2010).

b) Outcomes of teacher professional development programmes

Nine studies reported findings on outcomes of teacher development programmes aimed at the enhancement of assessment practices and skills. These programmes impacted on changes in classroom practice, such as an enhanced constructive alignment and an improvement in applying assessment strategies (*Jonsson, Lundahl, & Holmgren, 2015; *Wong, 2007). The developmental programmes also altered teachers' views about teaching, learning and instruction (e.g. *Crossland, 2012; *Harrison, 2005). Another reported outcome of teacher development programmes was a change in classroom culture and in school's assessment culture (*Jones & Moreland, 2005), for example, by the establishment of local communities of assessment practice (*Reimann & Wilson, 2012).

3.3.5. Teachers adapt to students' needs

Educational assessment refers to the ability of a skilled teacher to modify and adjust ongoing teaching and learning in response to students' individual pedagogical preferences. Teachers meet students at their level of knowledge and support students in how to progress based on their current achievement. Teachers' assessment practices include efficient and innovative teaching, monitoring and scaffolding activities, and differentiation between students.

Thirty studies investigated teachers' assessment practices in their classrooms and the perceptions teachers have towards teaching and learning. We grouped these findings into a) diversity in teachers' assessment practices; b) teachers' use of assessment strategies and their perceived competence; and c) teachers' perceptions towards assessment practices that support learning.

a) Diversity in teachers' assessment practices

Four studies published results about teachers' diversity in assessment practices. Teachers vary in the way they practise assessment (*Dixon, Hawe, & Parr, 2011; *Tolgfors, 2018). For example, *Dixon et al. (2011) noted differences in the degree of student involvement in assessment activities and the amount of control exerted by the teacher. Teacher assessment practices may also vary in quality, ranging from low quality, wherein assessment is mainly used for grading, to high quality, wherein a variety of assessment tools are used to promote learning (*Birenbaum, Kimron, & Shilton, 2011). In addition, quality also can be viewed in *how* teachers apply and act upon assessment tools that support learning (*Marshall & Drummond, 2006).

b) Teachers' use of assessment strategies and their perceived competence

Findings of studies that researched the assessment strategies used by teachers in the classroom generally show that teachers are not fully utilizing all available strategies (*Hawe & Parr, 2014; *Wong, 2014). In general, innovative assessment strategies that support learning and adapt to students' needs were not implemented on a regular basis in classrooms (e.g. *Hawe & Parr, 2014; *Marshall & Drummond, 2006). Teachers adhered to conventional practices, such as providing an overemphasis on tests (*Volante, 2010), or only presenting generally the learning goals to their students (*Hawe & Parr, 2014). Five studies investigated teachers' perceived competence in assessment practices. Teachers felt they were competent in giving oral feedback to students (*Tunku Ahmad et al., 2014). They perceived themselves as less competent in practices to impose different curricula for different groups of students (*Boyle & Charles, 2010), and in grading students' individual effort and ability (*Bramwell-Lalor & Rainford, 2016; *Tunku Ahmad et al., 2014).

c) Teachers' perceptions towards assessment practices that support learning

Seventeen studies targeted teachers' perceptions towards assessment

practices. Teachers valued assessment practices that are geared towards improving learning (*Colby-Kelly & Turner, 2008; *Warwick, Shaw, & Johnson, 2015). Teachers least valued practices that have a strong focus on performance orientation (*Warwick et al., 2015). Findings of studies that examined the consistency of teachers' values with their classroom assessment practices, specified a gap between teachers' values and their actual practice. Teachers favoured assessment tasks that improve learning and develop students' engagement in assessment, but practised assessment mainly to measure achievement and for accountability purposes (*James & Pedder, 2006). Furthermore, incongruences were noted between the perceptions of students and of teachers. Teachers generally perceived a higher level of assessment activities meant to promote learning as present in their classrooms than did students (*Leirhaug & Annerstedt, 2016; *Pat-El, Tillema, Segers, & Vedder, 2015).

3.4. Assessment learning environment

3.4.1. Supportive learning environment that engages students

Educational assessment refers to a learning environment wherein students feel safe and are encouraged to engage with the learning process. The focus is on the development of students' confidence and strengthening their motivation. Practices include opportunities to make and learn from errors and to help students to feel safe to take risks.

Eight studies researched aspects related to a supportive learning environment. A few studies investigated determinants that affect the engagement of students in learning and assessment activities (e.g. *Dijksterhuis, Schuwirth, Braat, Teunissen, & Scheele, 2013; *Lee & Coniam, 2013). With regard to students' confidence, students may experience difficulties in assessment activities that support learning, such as asking appropriate metacognitive questions, or judging themselves or their peers (*Ellery, 2008; *Sadeghi & Rahmati, 2017).

3.4.2. Aligned learning environment at the classroom and the program level

Educational assessment refers to the design and implementation of an aligned learning environment at both the classroom and the programme level, wherein teaching, learning, and assessment form an iterative relationship. Classroom practices embrace both formally structured and informally spontaneous activities that are spread evenly through the learning process. At the programme level, teaching, learning, and assessment sequences within and between courses are made explicit to various stakeholders.

The assessment learning environment was examined in 18 studies. We grouped these findings into a) cohesion between intended policy and actual classroom practice; b) the design of an assessment environment that supports learning; and c) implementation.

a) Cohesion between intended policy and actual classroom practice

Four studies researched the cohesion of an assessment learning environment between the intended policy on a national level and on the school level, and the actual practice on the classroom level. Policy on the national level showed cohesion with classroom practices (*Hume & Coll, 2009; *Lorente-Catalán & Kirk, 2016). However, there were mixed findings regarding consistency between the school and the classroom policy, indicating a gap between the assessment practices described in the curriculum and their actual use in the classroom (*Colby-Kelly & Turner, 2008; *Fenwick, 2017).

b) The design of an assessment environment that supports learning

Three studies targeted the design of an assessment learning environment that supports learning. For example, studies researched how the design of an assessment framework (*Macphail & Halbert, 2010) or an assessment task (*Davies, Pantzopoulos, & Gray, 2011) aided the learning and teaching process.

c) Implementation

Implementation of an assessment environment that supports learning was researched on a national, school and classroom level. These studies generally targeted facilitating and constraining factors that affected implementation. Successful implementation on a national level was enabled when there was trust between the various assessment stakeholders and when the programme was adapted to the local context (*Hopfenbeck, Flórez Petour, & Tolo, 2015). At the school level, facilitating elements for implementation were related to the active involvement of the school principal and an assessment literate team, and embedding the assessment environment as part of the school's culture (*Hill, 2011; *Nortvedt, Santos, & Pinto, 2016; *Smith & Engelsen, 2013). Findings of seven studies referred to the implementation of an assessment learning environment at the classroom level. In general, implementation was facilitated by teachers' commitment and teachers' growing competence in assessment principles and knowledge. Another enabler concerned the opportunity for teachers to engage in professional development (e.g. *Braund & DeLuca, 2018; *Lee & Coniam, 2013; *Webb & Jones, 2009). In various studies, the establishment of an appropriate classroom assessment culture was seen as crucial for successful implementation (e.g. *Mak & Lee, 2014; *Webb & Jones, 2009).

3.5. Educational outcomes of assessment

3.5.1. Enhance students' learning

Educational assessment refers to a focus on the teaching and learning process in order to enhance learning for all students to the maximum of their ability. Assessment practices are aimed at improving students' achievement and the quality of their work and improving the quality of teaching.

Eight studies researched the impact of assessment that supports learning on students' learning skills and strategies. In general, the employment of assessment strategies promoted interest in learning (*Fletcher, 2016; *Tolgfors, 2018; *Torrance, 2007). The impact of assessment on learning depends on how the pedagogical approach is realized (e.g. *Hume & Coll, 2009; *Torrance, 2007) and on intrapersonal factors of students, such as student motivation and interest (*Fletcher, 2016). Various assessment activities may contribute to the development of students' self-regulation and metacognition (e.g. *Baas, Castelijns, Vermeulen, Martens, & Segers, 2015; *Fletcher, 2016; *Hawe & Dixon, 2017). For example, when the assessment facilitates the sharing of learning goals and quality criteria, and provides students with tools that elicit evidence of learning (*Hawe & Dixon, 2017). However, the extensive support of a teacher in sharing criteria for success may also weaken student autonomy, as the more clearly task criteria and requirements are stated, the easier it will be for students to accomplish the task (*Torrance, 2007).

3.5.2. Determine the status of learning achievement

Educational assessment refers to the measuring and judging of learners', teachers' and schools' achievements in order to make informed decisions. These decisions relate to purposes of internal accountability, e.g., to get informed and evaluate what and how much has been learned, and to determine the outcomes of achievement. Secondly, decisions also relate to purposes of external accountability, such as certification, and high-stakes assessments.

Nine studies aimed to determine the status of learning achievement. These studies examined the effect of assessment on students' achievement. At the classroom level, the majority of the studies found positive effects through the achievement of higher scores for newly implemented assessment tasks or in learning environments that were meant to support learning (e.g. *Huang, 2015; *Li, 2018; *Wiliam, Lee, Harrison, & Black, 2004). However, at the national level, *Hopfenbeck et al. (2015) reported that despite successful implementation of an assessment learning environment in municipalities in Norway, the researchers did not find

an effect of the assessment programme on students' learning outcomes, measured by national tests in reading and mathematics.

4. Conclusions and discussion

In this scoping review, we analysed and synthesized the various definitions of Assessment as Learning (AaL), Assessment for Learning (AfL), and Assessment of Learning (AoL) published in research studies for common characteristics. Next, we examined what is known about the common characteristics of the assessment notions from findings reported in empirical studies. We have chosen to synthesize the definitions of the assessment notions because the definitions and descriptions overlap in meaning and are not used unambiguously in practice.

The synthesis of common characteristics of AaL, AfL, and AoL has resulted in nine themes that refer to how educational assessment relates to learning, as displayed in Box 1. For readability we used the term 'educational assessment' as an umbrella term that includes the common characteristics of AaL, AfL, and AoL. The themes are grouped into: 1) Student-teacher roles and relationships within assessment; (2) Assessment learning environment; and 3) Educational outcomes of assessment.

By viewing the assessment notions as a whole, the synthesis of the notions present a powerful approach to ensure and enhance students' learning (Biggs & Tang, 2011; Lau, 2016; *Taras, 2002). We do not argue that all notions are covered in all themes, or that the three assessment notions are equal to each other. However, we believe that the synthesis provides a more nuanced overview of assessment and learning than the individual descriptions and definitions of the assessment notions do. Although the focus on learning and students' active roles within learning processes is central to definitions of AaL and AfL, the results of this review give more profound insight in the roles and relationships students and teachers have within this process. For example, the synthesis provides insight that both students and teachers need to be literate in assessment. Students need to (learn to) understand the purposes and processes of assessment and need to be able to judge their work to become successful self-regulated learners (Sadler, 1989; Smith, Worsfold, Davies, Fisher, & McPhail, 2013). Teachers should be literate in assessment to be able to understand and differentiate the aims of assessment and to create and use assessment information to teach effectively (Pastore & Andrade, 2019; Xu & Brown, 2016). A more nuanced overview is also highlighted by the themes that relate to the context and outcomes of assessment. For example, the results of this review study provide awareness of the design of an environment that support learning. The learning environment should facilitate a continuous flow of (feedback) information to inform current teaching and learning, as well as to act upon (e.g., within or across modules, or throughout the curriculum). In our review study, many descriptions of the notion of AfL referred to the giving of feedback as a key strategy to support learning (e.g. Black & Wiliam, 2009). However, giving feedback to students does not improve their skills without those students engaging with and acting upon the feedback (Boud & Molloy, 2013; Winstone, Nash, Parker, & Rowntree, 2017). Consequently, assessment practices should be designed in a way that feedback is not seen as the end point of the learning process, but rather as the starting point (Burke, 2009).

In the second part of the scoping review, we used the thematic descriptions of the synthesis as a framework to analyse the results of the included empirical studies on their contributions to practice. In this section, conclusions are elaborated and implications for practice discussed. Regarding student-teacher roles and relationships within assessment, the content of the themes emphasizes the active role of the student in assessment and in directing their own learning. However, this conceptualization was underrepresented in the results of the empirical studies in this review. Only a few studies researched the interactive relationship between students and teachers, or reported findings about the shift towards a more active and central role of students in assessment. This indicates a gap between the thematic description that advocates an active role for students in assessment, and current practices that perpetuate a classroom culture wherein the majority of the teachers stick to traditional assessment practices. In practice, this means that students' learning is still dependent on the teacher (*Thompson et al., 2017). To make a shift towards a more student-centric perspective, we believe it is crucial to invest in both student and teacher intervention programmes. The content of such programmes should cover the knowledge and skills needed to become assessment literate and to fulfil the collaborative roles of teachers and students within the assessment process (*Swaffield, 2011). These programmes can help teachers to grow and feel competent in a more supportive role (*Harrison, 2005), and can guide students in their development to take a more active role within the assessment process (*Webb & Jones, 2009).

With regard to the assessment learning environment, the themes refer to a supportive and aligned environment that engages and motivates students in learning and that integrates the various assessment methods and functions at the classroom and the programme level (Lau, 2016; Zeng, Huang, Yu, & Chen, 2018). However, most studies that researched the assessment learning environment were aimed at

Box 1
Synthesis of common characteristics of the notions AaL, AfL, and AoL.

Educational assessment refers to:

1) **Student-teacher roles and relationships within assessment, wherein**
   a) Students are involved in assessing their own learning and activated as owners to take responsibility in directing their own learning.
   b) Students and teachers have a collaborative relationship, wherein they share roles and responsibilities.
   c) Students and teachers are continuously collecting and reflecting on various sources information to monitor progress and use this information to act on.
   d) Students and teachers are literate in talking about assessment and understand what quality looks like.
   e) Teachers are adapting to students' individual needs and preferences.
2) **An assessment learning environment, wherein**
   a) Students feel safe to take risks and are encouraged to engage with the assessment and learning process.
   b) The design and implementation of assessment and learning activities are aligned both within and between the classroom and the programme levels.
3) **Educational outcomes of assessment, that comprise**
   a) A focus on the teaching and learning process in order to enhance learning for all students.
   b) The measurement and judgement of assessment and learning activities to determine the status of achievement in order to make informed decisions.

facilitating and constraining aspects of the implementation, such as the role of the principal, a supportive assessment culture, and teachers' professional development (e.g. *Smith & Engelsen, 2013). None of the included studies reported findings about alignment between courses and/or between a course and the curriculum level. This may indicate that current assessment practices are oriented towards enhancing short-term learning (*Tan, 2013). In vocational and higher education, practices are often enabled by a modular degree structure and a system linked to grading (Jessop, Mcnab, & Gubby, 2012). Such practices tend to fix students' attention only on overcoming the hurdle to pass the modular assessment, without awareness of their learning beyond that period (*Tan, 2013). To integrate learning over a period of time and to avoid fragmentation of the curriculum (*Tan, 2011), we would like to emphasize the need to take a more programmatic perspective on the design and implementation of assessment and learning activities. Examples of a programmatic approach are found in health profession education within the concept of programmatic assessment. In programmatic assessment, individual methods of assessment are chosen for their alignment with the curriculum outcomes and their information value for the student and the teacher (Bok et al., 2013; Van der Vleuten et al., 2012; Van der Vleuten, Schuwirth, Driessen, Govaerts, & Heeneman, 2015).

Regarding the educational outcomes of assessment, the themes refer to two purposes of assessment: to enhance students' learning and to determine the status of learning achievement. The two purposes correspond to the traditional 'formative' and 'summative' functions of assessment, and to characteristics of the notions of AfL and AoL respectively (e.g. *Baird et al., 2017). In practice, often a tension between these two purposes was experienced. For example, the dominance of graded assessment tasks within a course may limit time for assessment tasks geared towards enhancing learning (*Mumm et al., 2016). There is agreement among researchers that the two purposes of assessment overlap (e.g. *Bennett, 2010; *Hargreaves, 2005) and that they should be connected with the overall teaching and learning environment (Lau, 2016). To obtain the benefit of each and to develop as a learner and as a learning organization, both purposes should be balanced in the design and implementation of the lesson plan, the course, and the curriculum. More research is needed to examine how the promotion of student learning and decision-making about the status of learning achievement can be balanced in an appropriate way. For example, by viewing assessment not as formative or summative, but as a continuum of low- and high-stakes assessments. Low-stakes assessment (e.g. narrative feedback or assessments that measure progress) continuously provide students and teachers with evidence of students' performance. This information can be used to (self)regulate students' learning. At the end of a learning trajectory, information from the various low-stakes assessments can be aggregated to make a high-stakes decisions for graduation or certification (*Schuwirth & van der Vleuten, 2012).

4.1. Limitations

We would like to highlight three important limitations of this review. Firstly, we only included research articles that referred to the assessment notions of AaL, AfL, and AoL as it was our intention to clarify the complex meanings and practices of these notions particularly. We therefore did not include research that focused on definitions and practices regarding assessments with formative and summative functions only, although these notions are widely used and may also be used interchangeably in practice. Moreover, due to time and source constraints we neither did include books that are written on this subject. Consequently, we acknowledge that our results may be biased and that there may be more thematic descriptions that relate to assessment and learning. Further integration of the assessment notions, by including more sources and/or the notions Formative assessment and Summative assessment, may be interesting for future research. Secondly, the findings of this study indicate that an assessment culture with a central role for students is still in its infancy. These findings may be affected by the search strategies we used for this review. For example, by not including specific search terms such as 'self-regulated learning' or 'autonomy'. However, a recent study by Winstone et al. (2017) that reviewed how students actively engage with feedback also noted that research on this topic was fragmented and underrepresented. More research is needed in this field. Thirdly, the synthesis provides limited guidance on "actionable practice" to support learning (*Tan, 2017, 199). Although the descriptions of the themes include examples of classroom practice, we believe that a successful approach to educational assessment does not rest on techniques that can simply be added to the teacher's repertoire (*James & Pedder, 2006). Assessment that supports learning is an approach which needs to be adapted for each context rather than a general framework that can be directly applied (*Baird et al., 2017; *Bennett, 2010).

Our review shows that many perspectives are important in an assessment culture focused on learning. We believe that the results of this review provide stakeholders with a clear and integrative view of how educational assessment relates to learning, which is a prerequisite to improve the assessment culture. The synthesis we provided can be used as a practical tool for teachers to improve their daily practices with students, for faculty development programs to better train teachers, and for institutions to better organize their assessment structure and programs. By synthesizing the notions of AaL, AfL, and AoL we challenged the differentiation of the assessment notions in literature. The synthesis mirrors how the assessment notions relate to learning and emphasizes that "assessment is learning" (*Hayward, 2015, 27). The notions of AaL, AfL, and AoL should therefore be seen in coherence with one another in order to establish an assessment culture that facilitates students' learning maximally.

Declaration of Competing Interest

The authors report no declarations of interest.

Appendix A. Description inclusion criteria

With regard to the first inclusion criteria, studies were excluded when the article concerned, for example, a commentary or book review. Regarding the second criterion, by 'focus on learning through assessment' we mean a focus on assessment in relation to learning, learning achievement, learning processes, etcetera. For example, studies that were aimed solely at learning strategies or at learning styles, but not at assessment, were excluded. By 'students' we mean the learning of a student. For example, studies that were aimed to investigate learning of a teacher, a surgeon or other professionals were excluded. By 'a regular physical educational context' we mean that studies were excluded when the context was not regular education, but was aimed at learning disabilities, special needs students, illnesses, or gifted students. With 'physical educational context' we intend that the assessment or examination or evaluation took place in a physical classroom or in a physical educational program in primary, secondary, vocational, or higher education. Thus, studies with a context of online learning, computer-based simulations, or MOOCs were excluded. Finally, with regard to the third criterion, studies were included when in the text of the article a description or definition was given how the notion of assessment related to the learning

of the student, or how it promoted learning.

Appendix B. Example process of coding research question 1 (RQ1) and research question 2 (RQ2)

B1 + B2 (RQ1)		
notion	Example B1 Text fragment description (node)	Example B2 Anonymized node used for coding
AaL	AaL is concept of assessment where students learn, self-correct, and collaborate during the assessment	Assessment is concept of assessment where students learn, self-correct, and collaborate during the assessment
AfL	Process of AfL includes classroom interaction, questioning, structured classroom activities, and feedback geared at helping students to bridge learning gaps	Process of Assessment includes classroom interaction, questioning, structured classroom activities, and feedback geared at helping students to bridge learning gaps
AoL	AoL constitute the certification of what and how much students have acquired over the course of learning.	Assessment constitutes the certification of what and how much students have acquired over the course of learning.

B3 (RQ1)	
Example coding	
Node	Codes
Process of Assessment includes classroom interaction (a), questioning (b), structured classroom activities (c), and feedback (d) geared at helping students to bridge learning gaps (e)	(a) Practice involves interaction (b) Practice involves questioning (c) Planned process (d) Practice involves feedback (e) Bridge learning gaps

B4 (RQ1)	
Example grouping categories into themes	
Example theme	Codes (n)
Enhancing students' learning	• Improve learning (57) • Focus on the process of learning (47) • Improve students' achievement (24) • Improve teaching (11) • Focus on the process of teaching (8) • Improve quality education (3)

B5 (RQ2) Example of a summary phrase
Summary phrase: 'by examining achievement of secondary school students who worked in classrooms wherein teachers were trained in their formative assessment strategies (= aim), findings indicated that improving formative assessment practices in classrooms produced tangible benefits in terms of achievement of externally mandated assessments with effect sizes 0.2−0.3 (= result)'

Appendix C. Overview of themes and codes assigned to a theme

Student - teacher roles and relationships	
Actively involved students	Codes (8) • practice involves self-assessment (68) • focus on students' SRL and autonomy (62) • students are active agents in own learning (49) • development of cognition and metacognition (32) • students are active agents in assessment (21) • practice involves peer-assessment (18) • development of critical thinking and inquiry skills (12) • development of life-long learning skills (8)
Collaborative relationship	Codes (11) • involves both students and teachers (46) • practice involves interaction (26) • student-centered perspective (19) • interactive process (13) • teacher as guide (13) • practice involves questioning (11) • social cultural perspective (11)

(*continued on next page*)

(*continued*)

Student - teacher roles and relationships	
	• constructivist or behaviorist perspective (11) • teacher-centered perspective (9) • practice involves collaboration (7) • students are passive (2)
Use various information sources to act upon	Codes (14) • practice involves feedback (95) • use of information (52) • collecting information (31) • gain students' understanding (23) • identify where students are in their learning (21) • identify where students need to go (20) • bridge learning gaps (17) • monitor the learning process (15) • inform learning (past, now, future) (12) • assessment as instructional tool (10) • identify learning needs (10) • provide opportunities (10) • information sources (4) • low-stakes assessment (3)
Assessment literacy	Codes (4) • practice involves quality criteria (27) • assessment literacy (15) • assessment as substitute for learning (10) • practice involves communication (7)
Teachers adapt to students' needs	Codes (6) • adjust ongoing teaching (27) • adapt to the needs of students (19) • pedagogical approach (11) • teacher provides support (9) • personalized (8) • key didactic skill (7)
The learning environment	
Supportive learning environment	Codes (6) • enhance motivation (12) • practice involves engaging students in learning (11) • development of students' confidence (9) • practice involves authenticity (5) • teachers' belief that students can improve (3) • alter students' attitudes (3)
Aligned learning environment at the classroom and programme level	Codes (10) • integrated entity (35) • practice involves learning goals (30) • classroom level (25) • collection of instruments, tools, tasks, and practices (25) • planned (formal) process (19) • assessment at the middle and/or at the end of learning (18) • unplanned (informal) continuous process (18) • part of everyday practice (15) • practice involves design of tasks (7) • provide rich learning environment (6)
Educational outcomes of assessment	
Enhancing students' learning	Codes (6) • improve learning (57) • focus on the process of learning (47) • improve students' achievement (24) • improve teaching (11) • focus on the process of teaching (8) • improve quality education (3)
Determining the status of learning achievement	Codes (7) • measure outcomes (44) • accountability (14) • practice involves making judgements (12) • result in a score or grade (7) • differentiating between students (5) • achieve high standards (4) • high-stakes assessment (3)

Note. Brackets refers to the number of text fragments (originating from descriptions of the assessment notions) assigned to a category.

Appendix D. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.stueduc.2021.101094.

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