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Teachers' Use of Assessment Data: A Review of Typological Research

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Abstract: *Over the past decade, increasing emphasis on data-informed instruction has intensified expectations for teachers to use assessment data to support instructional decision-making, accountability, and formative practice. Research consistently shows, however, that teachers engage with assessment data in varied ways, differing in purpose, depth of analysis, and instructional consequence. One prominent approach to capturing this variation has been the use of typologies, which classify patterns of teachers' assessment data use across contexts and research traditions. Despite the growing number of typological studies, the literature remains conceptually fragmented, with typologies emerging from different traditions, employing varied methodological approaches, and emphasising distinct analytical dimensions. This review of literature examines published typologies of teachers' assessment and data use, with particular attention to their conceptual foundations, methodological origins, and analytical focus. The reviewed typologies are organised into three broad orientations: practice-based typologies grounded in empirical accounts of classroom activity; conceptual typologies derived from theoretical synthesis and literature review; and orientation-based typologies that focus on teachers' beliefs and dispositions toward data use. Synthesis of the reviewed typologies reveals that most organise teachers implicitly along continua of data-use depth and purpose, yet these dimensions are rarely integrated across typological strands. Across contexts, teachers' data use is found to be dominated by instrumental and compliance-oriented practices, with inquiry-focused and formative uses remaining comparatively uncommon, even in reform-oriented settings. The review further highlights the influence of boundary conditions such as time, leadership support, data accessibility, and professional learning on teachers' typological positioning.*

Keywords: assessment data, assessment literacy, data-informed instruction, data use typology

1. Introduction

The past one decade has seen an increasing emphasis on teachers' assessment competencies. Teacher capacity to use assessment data as a basis of instructional improvement, accountability and evidence-informed instruction serve as integral part of daily teaching effectiveness (Kippers et al., 2018; Schildkamp & Datnow, 2020; Zakaria & Abdul Latif, 2023). This is in line with the shifting focus of educational system worldwide on assessment-based curriculum framework (Mandinach & Schildkamp, 2021; OECD, 2020). Within this context, teachers are expected to engage with diverse forms of data. In addition to progress and performance data, teachers' decision making and intervention strategies should also be informed by a plethora of

other data types such as learners' profile and interest, demographic information, and observational data (Bruniges, 2019; Vanlommel et al., 2017).

Despite these expectations, studies have revealed that teachers do not use assessment data in uniform ways. Their data engagement varies considerably in purpose, depth and instructional consequence. Studies by Othman (2018) and Razmawaty and Othman (2017), for examples, demonstrate that teachers employ assessment data primarily to meet reporting and accountability requirements. Teacher knowledge and understanding of assessment data is also low (Vanlommel et al., 2017; Zakaria & Abdul Latif, 2023) and their instructional decision making is not data-informed but governed by intuition and personal views (Andersen, 2020; Vanlommel et al., 2021; Zakaria & Abdul Latif, 2021). Teachers have been reported to rely only on one source of data (Andersen, 2020; Lasater et al., 2021); using assessment data only involving specific groups of students (Gelderblom et al., 2016; Mavroudi et al., 2021); data do not inform critical instructional decisions with the use of assessment data only at superficial level (Kippers et al., 2018; Schildkamp et al., 2016). It is interesting to note, however, that other studies have shared contradicting findings. Data is used more interpretively in the diagnosis of learning needs, adapt and differentiate instruction, and support formative feedback process (Michos et al., 2023; Zakaria et al., 2023). Assessment literate teachers demonstrate improved capacity in integrating evidence-informed instruction (Dyer, 2014; Mandinach & Gummer, 2016), are more likely to engage in purposeful analysis of assessment information (Cramer et al., 2015; Masters, 2018; Pastore, 2023) in supporting more coherent decision-making processes (Abrams et al., 2021; Lai & McNaughton, 2016; Van Geel et al., 2017).

One of the means of capturing variation of teachers' data use practice is through the adoption of typologies. Typologies offer a structured analytical lens for qualitatively distinguishing different forms of engagement with assessment data. Thus, enabling researchers to compare practices, beliefs and orientation across contexts and studies (Panadero & Lipnevich, 2022). Its development can either be derived from theory or literature (deductive) (Baidoo-Anu et al., 2023; Farley-Ripple et al., 2019; Pastore, 2023) or emerging from empirical patterns (inductive) (de Vries et al., 2024; Ikemoto & Marsh, 2007; Kennedy & Datnow, 2011). Typologies of teachers' use of assessment data have emerged from multiple research perspectives, including data-driven decision making, assessment literacy, formative assessment, and teacher professional learning (de Vries et al., 2017; Mandujano et al., 2025). The development of typologies often involves diverse methodological approaches – ranging from qualitative case analysis and interview-based studies to survey-focused research through the adoption of clustering and latent profile analysis (Knecht et al., 2026; Stapley et al., 2021).

Studies on teachers' assessment data use has largely concentrated on competencies, conditions, or outcomes, with typologies treated as secondary or illustrative rather than as objects of analysis in their own right. Although typologies are frequently embedded within empirical studies, there has been limited effort to examine how these typologies are constructed, what dimensions they represent, or how they relate to one another across research traditions (Lee et al., 2024; van Leeuwen et al., 2024). This review addresses this gap by positioning typologies as the central analytical focus. The review also offers a structured synthesis of how teachers' assessment data use has been classified across studies rather than subsuming typologies under broader thematic reviews. Additionally, typologies and profiles of teachers' data use have emerged from multiple theoretical perspectives, including organisational learning, assessment theory, data literacy, and teacher cognition, resulting in divergent terminology, assumptions, and analytical emphases (Lee et al., 2024; Mandujano et al., 2025). Prior work has acknowledged variation in data use practices but has rarely examined how different typologies

describe similar phenomena through parallel but non-intersecting lenses (Ikemoto & Marsh, 2007). By organising typologies into practice-based, conceptual, and orientation-based strands, this review makes fragmentation visible and analytically tractable. It helps clarifying how each strand emphasizes different aspects of teachers' engagement with assessment data. Furthermore, the present review contributes by distinguishing typologies according to their conceptual foundations and methodological origins, thereby clarifying what counts as a typology and how different forms of classification serve distinct analytical purposes. By synthesizing these typological approaches, the review aims to support more precise theorisation of teachers' assessment data use and inform future studies, professional development endeavours and instrument design.

2. Review of Typologies

The review focuses specifically on studies that classify teachers' engagement with assessment data into distinct categories, whether described as typologies, profiles, continua, clusters or quadrants. Rather than examining data use broadly, the review centers typology itself as the primary object of analysis, treating classification schemes as analytical components. The scope is confined to teachers' use of assessment-related data for instructional, evaluative, or decision-making purposes, excluding work that focuses solely on student analytics, system-level dashboards, or policy compliance without pedagogical relevance. The review spans multiple research perspectives, including assessment literacy, formative assessment, data literacy and data driven decision making (DDDM), in order to capture how typologies have emerged across disciplinary boundaries. Emphasis is placed on how typologies are constructed, dimensions focused, and what assumptions they embed, rather than on measuring prevalence or effectiveness of data use practices. The synthesis compares practice-based, conceptual, and orientation-based typologies to surface patterns, overlaps, and points of conceptual divergence across strands.

Ten typology-focused studies are reviewed. They include explicit or implicit classification of teachers' engagement with data or assessment, resulting in identifiable categories that differentiate forms of practice, orientation, or competence. Each study moves beyond simple variable analysis by grouping teachers into qualitatively distinct positions, whether through empirical clustering, conceptual reasoning, or analytic continua. The reviewed studies share a focus on variation rather than uniformity, seeking to explain why teachers differ in how they interpret, use, or respond to assessment data. Across all studies, classification is grounded in patterns of engagement, such as depth of analysis, purpose of data use, frequency of practice, or orientation toward assessment. Each study connects classification to instructional decision-making, assessment practice, or professional learning, ensuring relevance to classroom-level data use.

Literature focusing on typology development often presents profiles through rich textual discussion, as seen in the work of Baidoo-Anu et al. (2023) and Mund and Bergner (2023). However, the review of typologies presented in the following subsections is accompanied by a table detailing the profiles, in which information is extracted and synthesized from the specific literature reviewed. Of the ten studies reviewed, eight are explicitly focused on typologies and profiles. The remaining two include Ikemoto and Marsh's (2007) work which focuses on a quadrant model of DDDM, and Pastore's (2023) exploration of the foundational components of assessment literacy. However, both models contain classifications that distinguish different forms of engagement with data and assessment, making them analytically relevant to typological analysis.

The review of typologies related to data and assessment literacy reveals three broad categories of typologies. First, practice-based typologies are inductively derived from field data such as interviews, surveys or classroom observations, and they represent the lived realities of educators and students' engagement with data, assessment and evidence (de Vries et al., 2024; Mandujano et al., 2025). Second, conceptual or framework-based typologies are deductively informed by theory or synthesized from existing literature. They offer clarity and structure however are less directly grounded in empirical practice (Baidoo-Anu et al. ,2023; Farley-Ripple et al., 2019; Pastore, 2023). Third, orientation-based typologies focus on educators' stances, mindsets and orientations toward data use, often with a mix of conceptual reasoning and practitioner perspectives (Beck & Nunnaley, 2021; van Leeuwen et al., 2024). Key studies representing each of these major types are reviewed in the following subsections.

Practice-based Typologies: Grounded in Reality of Use

A strand of typologies that emerged from the review is practice-based, their development largely inductive and empirically derived. Studies focusing on the development of these typologies often with the aim to analyze variations in practice based on primary data such as surveys, interviews and observations (de Vries et al., 2024; Mandujano et al., 2025). Practice-based typologies are deeply rooted in the day-to-day realities of educators and students. They capture how teachers, administrators and students engage with data, assessment and evidence in authentic contexts (de Vries et al., 2024).

Ikemoto and Marsh (2007)

One of the earliest and most widely cited examples for data literacy is the work of Ikemoto and Marsh (2007), who propose a classification for data use through a quadrant of DDDM in the United States' K-12 education. The typology aims to capture the variations of data-driven practices and intended to guide educational practice and policy. Utilizing secondary analysis of two large RAND studies, the sampling includes 10 districts across four states. The two studies involved are the Institute for Learning (IFL) study (2002-2005), which examined district-led instructional improvement efforts in three IFL-partnered districts, and Finance study (2005), that focused on education finance systems and how data influenced resource decisions. Data collections were via interviews, focus groups, surveys and project documents. The interviews involved 130 district leaders (administrators, board members), 100 principals and 80 assistant principals and coaches; 115 teachers participated in the focus groups; with surveys received the responses of 2,197 teaches and 146 principals. A four-quadrant typology was developed based on two stages of analysis. In the first stage, project documents, interview notes and transcripts were analyzed to identify types of data used, analysis reports, enabling and hindering factors – resulting in a sample of 36 detailed examples (or cases) of DDDM from 7 districts. In the second stage, the examples were categorized into two continua based on the degree of complexity: type of data, nature of analysis and decision-making.

The classification consists of four quadrants of DDDM (Basic, Analysis-focused, Data-focused, Inquiry-Focus) with two continua of data and analysis/decision that range from simple to complex. It illustrates the variation in practices with most educators used simpler data format such as state test scores or relying on intuition. According to the authors, inquiry-focused models are rarer but they offer richer organizational learning and improvement. Seven factors are found to influence DDDM complexity:

i. Accessibility/timeliness of data
ii. Perceived validity of data
iii. Staff capacity and professional support
iv. Availability of time for collaborative inquiry

v. External partnerships and tools
vi. Organizational culture and leadership
vii. Policy context (e.g. No Child Left Behind Act emphasis on test data)

Table 1 presents the extracted information of the DDDM typology reported by the authors.

Table 1: Classifications of DDDM (Ikemoto & Marsh, 2007)

Profiles	Data Characteristics	Analysis and Decision-Making Characteristics	Examples
Basic DDDM	Simple data (e.g., one type of outcome data, often state test scores, single point in time, aggregate form)	Simple analysis (individual interpretation, reliance on intuition, one-time decision, limited expertise)	Principal uses state test scores to target teacher PD in math
Analysis-focused DDDM	Simple data (e.g., state/interim test data)	Complex analysis (collective/iterative examination, disaggregation, use of school expertise, frequent revisiting of data)	Leadership teams repeatedly analyze interim test results to place students in interventions
Data-focused DDDM	Complex data (multiple types: test scores, discipline data, demographic data, satisfaction surveys)	Simple analysis (one-time interpretation, reliance on hunches, minimal expert input, less rigorous techniques)	District uses surveys + multiple data types to decide on hiring reading specialists
Inquiry-focused DDDM	Complex data (multiple sources and forms, both quantitative & qualitative, longitudinal, triangulated)	Complex analysis (collaborative, iterative, draws on external/internal expertise, systematic inquiry protocols)	District + external partners use classroom observations, student work, and expertise to improve ELL instruction

de Vries et al. (2024)

Subsequent research has extended the typological approach to assessment literacy. de Vries et al. (2024) for example, examined how mathematic teachers in the Netherlands and Flanders enacted formative and summative assessment practices.120 Dutch and 83 Flemish's secondary mathematics teachers (n=203) were sampled through a cross-sectional survey using a validated questionnaire by Christoforidou et al. (2014). Hierarchical cluster analysis using Ward method was conducted in producing the profiles.

The profiles of teachers' assessment techniques describe the frequency of teachers' use of assessment tools ranging from the adoption written and oral assessments to other varied techniques. The profiles of student involvement describe assessment ownerships: categorically from ones that were heavily teacher-centered to a well-distributed ownership between teachers and students. The study reports that most classrooms are still dominated by summative, teacher-centered assessment. The authors also reveal that teachers with varied assessment techniques tend to involve students more representing advanced formative practice, however this was formed by a small percentage (3.9%). Contextual differences are identified: Flemish teachers rely strongly on traditional written tests and teacher-centered assessments, while Dutch teachers use varied techniques and involve students in their assessment activities. The authors produce a series of tables, each detailing the profile extensively. Tables 2, 3 and 4 below are based on the synthesized information from the original information provided by the authors.

Table 2: Profiles of teachers' assessment techniques (de Vries et al., 2024)

	Profiles	Characteristics	Prevalence
More summative	Profile 1 Frequent use of written assessment	Heavy reliance on traditional written tests (paper-and-pencil exams, quizzes).	38.9%

	Profile 2 Frequent use of written assessment and written exercises	Combines formal written tests with additional written tasks (e.g., problem sets, exercises).	10.3%
	Profile 3 Regular use of written and oral assessment	Uses both written tests and oral questioning/discussion as assessment tools.	20.2%
	Profile 4 Irregular use of a variety of assessment techniques	Employs multiple assessment types but inconsistently or infrequently.	15.8%
More formative	Profile 5 Regular use of a variety of assessment techniques	Applies a broad, balanced range of assessment strategies consistently.	14.8%

Table 3: Profiles of student involvement in assessment (de Vries et al., 2024)

	Profiles	Characteristics	Prevalence
More summative	Profile 1 Teacher assessment ownership	Responsibility for assessment lies almost entirely with the teacher.	44.3%
	Profile 2 Frequent teacher and regular student assessment involvement	Teacher directs assessment but includes systematic student self-assessment.	30.5%
	Profile 3 Evenly distributed across teacher and student	Assessment responsibility more evenly split between teacher and students.	13.3%
More formative	Profile 4 Evenly distributed across all agents	Strong presence of peer assessment alongside teacher and student input.	11.8%

Table 4: Cross-tabulation of assessment techniques and student involvement profiles (de Vries et al., 2024)

		Profile 1 Frequent use of written assessment	**Profile 2** Frequent use of written assessment and written exercises	**Profile 3** Regular use of written and oral assessment	**Profile 4** Irregular use of a variety of assessment techniques	**Profile 5** Regular use of a variety of assessment techniques
		More summative			More formative	
More summative	Profile 1 Teacher assessment ownership	Predominantly traditional, exam-driven; teacher controls all decisions.	Teacher remains central; exercises supplement tests but student voice absent.	Teacher-led questioning adds variety, but control still rests with teacher.	Teacher uses multiple tools inconsistently but retains full control.	Despite varied techniques, assessment remains teacher-owned, showing weak student empowerment
	Profile 2 Frequent teacher and regular student assessment involvement	Written tests dominate, but some structured opportunities for student self-checking.	Written tasks sometimes include reflective components for students.	Oral questioning allows for limited student reflection alongside teacher judgment.	Occasional variation gives students some input but irregularly applied.	Students regularly engage in self-assessment within a varied assessment framework.

	Profile 3 Evenly distributed across teacher and student	Teacher and students share responsibility, but reliance on tests keeps approach summative.	Exercises support shared assessment, with students moderately involved.	More balanced approach: oral and written work jointly assessed by teacher and students.	Shared responsibility though variety of techniques used inconsistently.	Strong shared practice with students co-owning varied and regular assessments.
More formative	Profile 4 Evenly distributed across all agents	Rare: teacher-led tests with attempts to involve both students and peers.	Occasional peer/self-involvement in written exercises, but unevenly applied.	Stronger peer/student involvement possible through oral assessment tasks.	Varied but irregular techniques allow distributed assessment, though not systematic.	Most advanced: consistent use of multiple assessment tools with balanced ownership among teacher, students, and peers (fully formative).

Mandujano et al. (2025)

Mandujano et al. (2025) advance the use of typologies by focusing on primary school teachers in Mexico. Their large-scale study identifies teacher profiles associated with assessment practices and explores how these profiles vary across socio-demographic factors. The study is cross-sectional with 4,674 primary school teachers in Baja California, Mexico, responded to a survey, 77 percent of which are female teachers with the average age of 38. The 47-item questionnaire measures the assessment practice across five dimensions (purpose, object, strategies, interpretation, and communication of results). Latent class analysis is adopted to identify teacher profiles, with t-tests and chi-square to test socio-demographic differences.

Two distinct teacher assessment profiles are identified: intensive (enthusiastic and frequent users) and moderate (less frequent but still engaged). The authors find that the main difference between the profiles lies in frequency and not the type of practices. Both profiles adopt similar assessment instruments such as tests, portfolios, and rubrics, the findings however suggest that intensive users integrated their use more often. Socio-demographic factors such as gender, age, training, experience, sector and school location help differentiate profiles, but the effect sizes are generally small. The findings support the need for differentiated strategies to strengthen assessment practices, especially in rural and public school settings. Table 5 provides an adapted information of the teacher profiles.

Table 5: Profiles of mathematic teachers' assessment practices (Mandujano et al., 2025)

Profile	Characteristics	Demographic Patterns	Implications
Intensive Profile (55%)	Frequently engage in a wide range of assessment practices; emphasize both formative and summative purposes; strong use of problem-solving, communication with families, and formative strategies.	More likely female, younger, <10 years of experience, recent continuous training; more common in private and urban schools	Represents enthusiastic adopters; can serve as models/mentors; sustained PD can deepen sophistication.
Moderate Profile (45%)	Engage less frequently in assessment practices, though still report "almost always" for many	Slightly older, more male teachers, more years of experience; more common	Require targeted PD and support; need resources and capacity-building to

	items; use similar instruments but with lower frequency	in public and rural/marginalised schools.	increase intensity and consistency.

Mund and Bergner (2023)

Typologies have also been employed to conceptualize data literacy more broadly. In Mund and Bergner's (2023) study, this involves the intersection of awareness and action. Mund and Bergner examined the relationship between awareness of data practices and actions taken to manage personal data. 19 participants (consisting of school and university students as well as working adults) across different age groups across five major United States' cities were recruited via purposive sampling. Sampling criteria include age, education and data experience. Interview sessions were carried out online (via Zoom) to measure participants' conception of data, data engagement, personal data management, and statistical thinking. Sessions were audio-recorded, manually transcribed and thematically analyse (deductive and inductive) with qualitative analysis software. The analysis enabled for participants to be plotted on an awareness-action grid (two-dimensional plane) with comparative ranking using high, medium, low awareness/action) in locating the participants' specific position on the grid. This resulted in seven personas identified as clusters along the typological space, presented in Table 6.

The findings reveal that awareness and action do not necessarily work in tandem – high awareness does not always lead to strong action. The findings also show age-group patterns: middle schoolers are dominant in *Data Young*, with optimistic action but limited knowledge. The high schooler group is predominantly in *Data Meh*, having low level of awareness and action. Clustered around *Data Aware* are the undergraduates, and adults are more likely to experience guild, anguish, or detachment. Cognitive dissonance is commonly found in adults, where individuals experience high awareness but low level of action, leading to guilt or anguish. The typology unveils gaps between knowledge and behaviour, and highlights how empowerment in data literacy depends not only on awareness but also on the willingness and capacity to act.

Table 6: Awareness-Action Typology of Data Literacy Personas (adapted from Mund & Bergner, 2023)

Persona	Awareness Level	Action Level	Characteristics
Data Meh	Low	Low	Indifferent toward data, little concern or engagement, low cognitive dissonance.
Data Young	Low	Moderate/ Higher than awareness	Naïve but active; take protective or evaluative steps without deep understanding. Often middle schoolers.
Data Aware	Moderate	Commensurate (balanced)	Consistent practices aligning with awareness; cautious engagement with data.
Data Guru	High	High	Ideal type; strong awareness with equally strong protective action.
Data Guilty	Moderate-High	Lower than awareness	Express guilt for failing to act despite knowing risks; feel underperforming.
Data Anguished	High	Very low	Strong awareness with very little action; leads to anxiety, stress, dissonance.
Data Over confident	High	Very low (without guilt)	Comfortable ignoring risks despite awareness; rationalize or trivialize inaction.

Kennedy and Datnow (2011)

Another strand of practice-based work has focused on the role of students themselves in data use processes. Kennedy and Datnow (2011) introduce a three-tier typology of student involvement in data-driven decision-making. The authors argue that existing frameworks do not sufficiently capture student engagement in DDDM, prompting the authors to examine the

extent students are given access to data, engage in using the data, and included in school-level reform decisions. The study employs cross-case qualitative method with the selection of 8 exemplar school systems (4 elementary-level districts, 4 high school systems; both traditional public and charter schools). Schools were chosen based on the reputations for strong use of data driven instruction and had demonstrated improvement in student achievement. Purposive sampling was adopted, targeting schools serving diverse and low-income and minority student populations. Data collection involved 120 interviews with district and school administrators as well as teachers, classroom and meeting observations (8-10 classrooms per site), and focus groups at each school site. Case reports were organized for each of the eight school systems, data within each case was thematically analysed. This was then followed by a cross-case analysis to compare patterns across sites. The analysis aimed to identify recurring forms of student involvement, or lack thereof, that were present across different contexts. Three distinct tiers of student involvement are identified: *tier 1 (active, dialogic involvement in reform); tier 2 (using data to assess student engagement)*; and *tier 3 (engaging students in reflection on their own data).* The authors stress that sustainable reform requires integration of all three tiers. While the typology is originally described in textual form, Table 7 simplifies them into a tabular summary to highlight each tier and the key characteristics.

Table 7: Typology of Student Involvement in DDDM (Kennedy & Datnow, 2011)

Tiers	Characteristics	Examples from Study	Prevalence
Tier 1 Students' Active, Dialogic Involvement in Reform	Students act as partners in designing, discussing, and implementing data-driven reforms; dialogic and democratic process.	Student representatives in reform planning meetings; engaging students in decision-making on school improvement strategies.	Very rare; isolated cases only.
Tier 2 Using Data to Assess Student Engagement	Schools collect and analyze data on student engagement in learning (attendance, discipline, homework, participation) to inform reforms; students are subjects of data, not active participants.	Monitoring discipline referrals, surveys on engagement, tracking homework completion.	Present across multiple schools; more common than Tier 1.
Tier 3 Engaging Students in Data Analysis and Reflection	Students review their own performance data, reflect, and set goals; responsibility for improvement rests on students; often compliance-oriented.	Students receive test score reports, track progress, complete reflection sheets, or set performance targets.	Most common; observed in almost all cases studied.

The findings indicate that student involvement in the planning and implementation of reforms is minimal even in exemplar DDDM districts. The authors reveal that most districts emphasize Tier 2 and Tier 3 practices where data is used to target student engagement, and students analyse their own performance data such as self-tracking, reflections and goal setting. Kennedy and Datnow (2011) argue that although Tier 3 fosters accountability, motivation, and ownership of learning, the culture promotes the risk of reducing data engagement to test-driven compliance rather than deep learning.

Conceptual Typologies: Theoretical and Review-based Focus

In contrast to practice-based typologies that emerge inductively from field data, conceptual typologies are constructed through theoretical reasoning, systematic reviews, and adaptation of established frameworks. The primary strength lies in providing definitional clarity and structural coherence to complex constructs such as data literacy, assessment literacy, and evidence-informed practice. These typologies function as ideal types that help educators frame

discussions, design interventions and establish a common vocabulary, drawing upon literature, standards or philosophical perspectives.

Farley-Ripple et al. (2019)

Farley-Ripple et al. (2019) seek to address the absence of a consistent framework for understanding how teachers use assessment data in instructional decision-making. The study employs a multistage, mixed-methods design through the use of exploratory sequential and convergent mixed-methods. In the first phase, framework development, the review of literature, input from research team and collaboration with the NWEA (MAP developers) resulted in the initial inventory of 40 instructional decisions organized into a three-level framework. The second phase, framework evaluation, engaged 188 elementary teachers from 20 schools across five American districts with an online survey. In addition, 18 teachers were interviewed and 18 PLC meetings were observed. Descriptive statistics, confirmatory factor analysis and reliability testing were carried out to refine the framework and validate its categories. The three-tier framework classifies teachers' data use at the *domain level* (instrumental vs. conceptual uses), the *action level* (e.g., instruction, placement, goal setting, celebration; versus learning about students, teaching, system reflection, gathering more information), and the *practice level* (36 discrete practices). Table 8 illustrates the synthesized information on teachers' use of assessment data, derived from the more extensive profiles produced by the authors.

Table 8: Classification of teachers' use of assessment data in instructional decision-making (Farley-Ripple et al., 2019)

Domain	Action Categories	Examples of Practices
Instrumental Uses (forward-looking, action-oriented)	▪ Instruction (planning, strategies, content, grouping/differentiation) ▪ Placement decisions ▪ Goal setting (students/class/teams) ▪ Celebration	▪ Grouping students for targeted activities ▪ Reteaching or modifying lesson plans ▪ Adapting instructional strategies ▪ Placing students in remedial/enrichment tracks ▪ Setting goals for students, IEPs, or class ▪ Celebrating growth or achievement in class or with parents
Conceptual Uses (backward-looking, knowledge/ reflective)	▪ Learning about students ▪ Learning about teaching ▪ Learning about the system ▪ Gathering additional information	▪ Analyzing data to reflect on student strengths/weaknesses ▪ Using data to reflect on effectiveness of instructional strategies ▪ Discussing system-level trends in PLCs ▪ Collecting complementary data (surveys, observations) to understand context better

Baidoo-Anu et al. (2023)

Subsequent research has extended the scope of conceptual typologies to teachers' beliefs and attitudes. Baidoo-Anu et al. (2023) examine this dimension in the Ghanaian context, developing latent profiles that capture how varying levels of belief in student self-assessment (SSA) shape the extent and manner of data use. The study adopts cross-sectional survey involving 248 basic and senior high school teachers in Ghana. Exploratory factor analysis is utilized to identify belief dimensions; latent profile analysis to classify teachers into groups; and chi-square tests to examine associations between teacher demographics and profile membership. Four belief dimensions towards students' self-assessment are identified: *positive belief, developing positive belief, negative belief*, and *confidence in students' self-assessment capacity*. Additionally, five latent profiles are derived leading to the typology development. Junior high teachers are found to be more supportive than their primary and senior counterparts; with early career teachers demonstrate disinterest, mid-career more positive, and late-career

often strongly negative. In relation to age, younger teachers (20-25 years old) display disinterest, mid-range (26-30 years old) are commonly more supportive, with older groups lean towards negative/low support. Table 9 presents the five latent profiles in a tabular summary to highlight the key characteristics.

Table 9: Association of teachers' beliefs and attitudes towards students' self-assessment (Baidoo-Anu et al, 2023)

Profile	Characteristics	Prevalence	Key Insights
No interest in SSA	Reject SSA's usefulness; little to no trust in students' ability to self-assess; see SSA as irrelevant.	30.8%	Hardest group to engage; requires strong awareness-raising and cultural change efforts.
SSA supportive of learning	Believe SSA enhances reflection, metacognition, and learning; but rarely implement practices to support it (e.g., rubrics, feedback time).	26.4%	PD should focus on translating positive beliefs into practical classroom strategies.
Mixed beliefs	Acknowledge SSA's potential benefits but express doubts about objectivity, fairness, and students' ability.	6.2%	Targeted support to address misconceptions and build confidence in reliability of SSA.
Low support for SSA	Some confidence in students' capacity but skeptical about SSA's impact on learning; view it as time-consuming.	12.6%	Training should emphasize efficiency strategies and evidence of impact to overcome reluctance.
SSA as bad	Strongly negative attitudes; perceive SSA as inappropriate, ineffective, and unreliable.	24%	Require deep cultural shift interventions; may resist reforms without systemic support and accountability.

*SSA: Students' self-assessment

Pastore (2023)

Conceptual typologies have also been used to clarify the very definitions of assessment literacy itself. Pastore (2023) conducts a systematic review of teacher assessment literacy literature, synthesizing its perspectives into a three-cluster typology that illustrates how the construct has been theorized across different contexts and traditions. The aims are to gather TAL's definitions, identify the foundational constructs/components, the theoretical approaches and methodologies employed, and highlight implications for teacher education and professional development. 42 studies spanning a decade (2013-2022) focusing on TAL in compulsory education are systematically reviewed. The studies concentrate in English-speaking countries (United States of America, Canada, Australia and New Zealand) mostly involving pre-service teachers, very few studies are on in-service teachers. Three clusters of TAL definitions are reported: *essentialist* (technical skills), *socio-cultural* (contextual practice shaped by beliefs and identities), and *holistic/adaptive* (integrating skills, dispositions, and contextual understanding).

Table 10: Categories of TAL definitions (Pastore, 2023)

Profile	Characteristics
Essentialist Definitions	Narrow, technical emphasis on knowledge and skills to construct, score, interpret, and report assessments. Often linked to standards (e.g., Popham, Stiggins).
Socio-cultural Definitions	Contextual and practice-oriented; sees TAL as dynamic, shaped by teacher identity, beliefs, and interaction with students
Holistic/ Adaptive Competence	Integrative models combining knowledge, skills, dispositions, socio-emotional, and contextual dimensions. Sees TAL as adaptive to context.

Orientation-based Typologies: Stances and Mindsets

A third strand of typological work focuses on orientations, stances and mindsets that underpin educators' engagement with data and assessment. Orientation-based typologies highlight the attitudinal and dispositional dimensions of data literacy, emphasizing how educators position themselves towards data. Constructs such as confidence, skepticism, compliance or enthusiasm are impactful in shaping practice (Beck & Nunnaley, 2021). By mapping orientations along these continua, motivations and barriers can be identified (Van Leeuwen et al., 2024).

Van Leeuwen et al. (2024)

Van Leeuwen et al. (2024) describe teachers' use of computer-based assessment data as ranging from *disengaged users, early-stage users, selective users* and *engaged users*. The study aims to understand the manner and motivation for teachers' data use for differentiated instruction, and to provide recommendations for PD. Five Dutch secondary schools already using computer-based assessment (CBA) programs were approached, with teachers who had experience with CBA and student data (SD) were invited to participate. Participation was voluntary, hence, the final sample of 42 teachers agreed to take part in the survey and logbook study. The survey measures CBA and SD use, self-efficacy, attitudes and perceived social norms, and data was analyzed through the use of cluster analysis (Ward's method) in constructing the typology. Based on the responses from the survey, 10 teachers were selected based on their high and low data use to explore their reasons and experiences. The purposive recruitment aims to validate and elaborate the cluster findings specifically looking into motivations, barriers and experiences of teachers at the far ends of the usage spectrum. The logbook requires the participants to record their use of CBA (e.g. time and frequency of data use, student data consultation, and the influence of its use on teaching such as changes in lesson, grouping, differentiation) over a period of 20 weeks. Cluster analysis using Ward's method was performed in constructing the typology. The typology was originally detailed in narrative form, and is synthesized here into tabular format.

The authors identify that teachers' data use is not only characterized by its frequency, but also their attitudes and self-efficacy. The study also finds lack of confidence, negative attitudes and weak institutional culture as major barriers for the disengaged and early-stage users. Only a subset of teachers shows real-time data use in class, a high degree of data use is invested on lesson planning. The authors recommend different PD pathways for each type of users on their typology. Table 11 presents a summary of the typology described by van Leeuwen et al. (2024).

Table 11: Typology of Teachers' Use of Student Data from Computer-Based Assessment Program (van Leeuwen et al., 2024)

Profile	Characteristics	Key Insights	PD Pathways
Engaged Users	High use of CBAs; average–high use of SD (mainly between classes, less during class); above-average influence on teaching; positive attitude towards SD; average self-efficacy.	Use SD mainly to prepare lessons and adjust planning; benefit from PD on real-time/in-class use.	Training in real-time use during lessons
Selective Users	Low CBA use, but frequent SD use (during and between classes); high influence of SD on teaching; positive attitude; high self-efficacy for SD.	Need school-level support to strengthen social norms and leadership around CBAs and SD use.	Strengthened social norms and leadership support.
Early-stage Users	Average CBA use; below-average SD use; more SD use during class than between classes; positive attitude but low self-efficacy; report low influence on teaching.	Require PD on building competence and confidence in using CBAs and SD effectively.	Self-efficacy building and guided practice.

Disengaged Users	Low on all variables (low CBA use, low SD use, negative attitude, low self-efficacy, weak social norms); little impact of SD on teaching.	Need interventions to shift attitudes and motivation, e.g., peer modelling and successful experiences.	Attitude change and peer mentoring.

*CBA: Computer-based assessment data, SD: student data

Beck and Nunnaley (2021)

Beck and Nunnaley (2021) introduces a continuum of Data Literacy for Teaching (DLFT) that spans pre-service to in-service teacher education. DLFT is conceptualized as a metaconstruct that includes assessment literacy. The main aim is to provide educators, curriculum designers and PD providers with a structured framework to enhance teachers' capacity for data-informed instruction. Table 12 presents the synthesized version of the authors' work.

Its development drew on two empirically established models: Mandinach and Gummer's (2016) DLFT framework and Kipper et al.'s (2018) Data Use Model. These were triangulated with an extensive literature on pre-service and in-service preparation for DLFT and assessment literacy, evidence from national and international studies, and practical insights from PD initiatives led by Using Data Solutions. The continuum was informed by multiple prior studies containing insights from pre-service and in-service teachers, teacher educators and PD programs without recruiting any actual participants. Data analysis involved conceptual triangulation of the two models, with comparative analysis carried out to map overlapping components across frameworks addressing the following data use procedures:

i. Identifying issues/goals
ii. Collecting/managing data
iii. Transforming data into information
iv. Making instructional decisions
v. Evaluating outcomes.

This was then followed by framework refinement by using Schulman's (1987 categories of teacher knowledge development (novice to expert) to structure progression stages in DLFT, leading to the production of a four-level continuum: *novice user, developing user, developing expert user*, and *expert user*.

Table 12: Continuum of Data Literacy for Teaching (Beck & Nunnaley, 2021)

Profile	Characteristics	Support Strategies
Expert User	Proficient and reflective; mentors peers and leads PLCs; embeds data use in instructional leadership; deep understanding of ethics and context.	Develop leadership pathways; support teacher-led inquiry projects; integrate advanced PD on mentoring and system-level data leadership.
Developing Expert User	Solid skills in identifying, collecting, and analyzing diverse data; collaborates with stakeholders; uses data ethically; connects insights to practice.	Provide opportunities for cross-disciplinary collaboration; advanced workshops on ethical/contextual use; mentor-mentee arrangements.
Developing User	Begins to identify relevant data and stakeholders; makes basic links between data and instruction; gaining confidence in simple analyses.	Offer scaffolded training in simple analysis and visualization; encourage early collaboration with peers; link data to concrete instructional examples.
Novice User	Limited ability to identify relevant data sources; narrow, compliance-driven view of data; minimal analysis or application.	Introduce foundational data concepts; provide guided practice with basic data tools; emphasize purpose of data beyond compliance.

3. Discussion

The review of literature of typologies involving teachers' data engagement and DDDM reveals a consistent pattern: teachers' use of assessment data exists along continua of complexity, engagement and purpose. Most typologies implicitly organize teachers along axes of depth of data engagement and purpose of use. For examples, Ikemoto and Marsh (2007) organize their four DDDM types based on data complexity from simple to complex; Farley-Ripple et al. (2019) present theirs based on data-use purposes; with van Leeuwen et al. (2024) classify teachers' data engagement based on both depth of use and purpose. Conceptual typologies are found to prioritize definitional clarity and structural coherence (Beck & Nunnaley, 2021; Farley-Ripple et al., 2019; Pastore, 2023). Practice-based typologies, on the other hand, place stronger emphasis on teachers' instructional and assessment routine and practice (de Vries et al., 2024; Kennedy & Datnow, 2011; Mandujano et al., 2025). Orientation-based typologies highlight affective and dispositional dimensions (Baidoo-Anu et al., 2023; Mund & Bergner, 2023). The review also unveils that the focus of these three strands of typologies rarely intersect. This results in parallel bodies of knowledge that describe similar phenomena using different analytical lenses: practice-based typologies largely omit explicit treatment of beliefs or affective components (de Vries et al., 2024; Mandujano et al., 2025); conceptual typologies offer theoretical clarity with little association to daily classroom routines (Beck & Nunnaley, 2021; Pastore, 2023); similarly with orientation-based typologies with low emphasis on classroom instruction (Baidoo-Anu et al., 2023).

Across the reviewed typologies, teachers' use of assessment data is characterized by compliance-oriented practices rather than inquiry-driven or formative engagement. Practice-based typologies consistently demonstrate that most teachers operate within lower-complexity or moderate-use categories (de Vries et al. 2024; Mandujano et al., 2025; van Leeuwen et al., 2024). They rely on test scores, frequency-driven practices and routine reporting requirements (de Vries et al., 2024; Ikemoto & Marsh, 2007). The teachers in Ikemoto and Marsh's (2007) study describe the reliance on standardized test results, one-off analyses and data use for reporting; Kennedy and Datnow (2011) find data use practice that often centres on summative and performance rather than formative engagement. Even in studies conducted within reform-oriented or high-performing contexts, inquiry-focused and formative use of data remain limited (Mandujano et al., 2025; van Leeuwen et al., 2024). Van Leeuwen and his co-authors (2024) further report that policy-aligned beliefs about data use do not automatically translates into enacted practice, even in supportive environments.

Typologies that include contextual variables reveal that limitation of data use is not necessarily a function of teachers' resistance or lack of interest. In fact, teachers are affected by factors such as time constraint, leadership support, data accessibility and professional learning opportunities that continuously shape data use practice. For example, Ikemoto and Marsh (2007) as well as van Leeuwen et al. (2024) cite time as a critical disabler for teachers' use of assessment data. Time limitation compels the teachers in Ikemoto and Marsh's (2007) study to engage only with basic data and forgo analysis and inquiry-focused DDDM practices; whereas in van Leeuwen et al.'s (2024), limited time has been cited as a key reason for their refusal to engage with computer-based assessment data beyond lesson planning. Data access is also a critical factor. The teachers in Farley-Ripple et al. (2019), for instance, only work with standardized test results due to the lack of access to other data types. Across typologies, professional learning is consistently implicated in shaping teachers' decision making and data use practice. The typology by Van Leeuwen et al. (2024) clearly presents a link to differentiated professional development pathways. They argue that disengaged and early-stage teachers

require confidence building and guided practice; while engaged users benefit from advanced, in-class data use support. Similarly, Beck and Nunnaley (2021) conceptualize progression along a DLFT continuum as contingent on structured professional learning rather than mere exposure to data.

4. Limitations of the Review

This review draws on a limited number of typologies. As such, the patterns identified should be interpreted as indicative rather than comprehensive of the broader literature on teachers' assessment data use. Additionally, within each typological orientation (conceptual, orientation-based and practice-based), the review includes only two to three key typologies. This constrains the extent to which systematic comparison or generalization across orientations can be made. It is important to note that as the review focuses on typologies that are explicitly identifiable within the literature, relevant studies that discuss variations in data use without typological classification are underrepresented. The analysis also relies on authors' original conceptualizations and category labels. As such, interpretations of typological boundaries and dimensions remain partly dependent on how these were framed in the primary studies. Direct comparison between typologies is constrained by differences in methodological design, data sources and analytical depth. This is particularly apparent between typologies developed through qualitative inquiry and those derived from quantitative profiling.

5. Implications and Recommendations

The review offers important insights into how teachers' use of assessment data is conceptualized, studied and supported. One of the findings involves compliance-oriented data use practice across contexts, suggesting a misalignment between policy aspirations and classroom realities. Policymakers should reconsider the assumptions that access to data alone will lead to sophisticated instructional decision-making. In addition, policies centred on accountability may inadvertently reinforce instrumental uses of assessments. Thus, reducing opportunities for formative and inquiry-based practices. If policies promoting data-informed instruction are to be implemented in practice, effective system-level supports must be in place with consideration for the provision of sufficient time, leadership guidance and accessible data systems.

A majority of the reviewed typologies focus at individual teacher level with emphasis on data use based on depth and purpose. In relation to data-use, teachers are mainly reported to function at the lower end of the continua with their engagement with assessment data described as basic, low, disengaged or instrumental. The review has also shown that low level of data engagement does not correlate with their data use competencies, but greatly influenced by boundary conditions involving factors such as time, leadership support and data infrastructure. Therefore, future studies should place greater attention to these boundary conditions as they shape what teachers can realistically do regardless of their intentions or competence.

The review also highlights the limitations of sole reliance on frequency-based and self-reported measures. For examples, many typologies rely on frequency of teachers' data use and what tools they report using; while literature on data use and DDDM have emphasized critical teachers' competencies in interpreting data and how data shapes their instructional decisions – these have been underrepresented. Additionally, the findings reveal that many typologies assume categories are stable and they represent snapshots of cognition and practice. Very little information is available if teachers move between categories, if movement lasts and if context

forces regression. At the same time, typologies produced grounded in mixed-methods approaches are able to demonstrate alignment between reported practice, enacted routines and underlying orientations. Therefore, future typology-focused studies should employ mixed-methods approaches with longitudinal designs. This will enable investigation of teachers' data use whether movement across typological categories is possible, sustained or context-dependent.

Researchers proposing new typologies should establish clear classificatory logic. The review shows that typology development focus on categories labelled as *types, profiles* or *levels*. However, there are some ambiguities in why these categories exist, how teachers are assigned to them and whether categories are hierarchical, developmental, parallel or simply descriptive. The lack of such clarity makes it difficult for typologies to be reliably compared across studies, and typologies risk becoming descriptive without explanatory power. Therefore, future typologies research should make both its contextual assumptions and classificatory logic explicit.

6. Conclusion

This review examines how typologies have been used to classify teachers' engagement with assessment data. Across ten reviewed studies, typologies were found to play a crucial role in making visible the diversity of teachers' data use practices, yet they varied substantially in conceptual grounding, methodological design, and analytical focus. Synthesis of the literature revealed that most typologies, whether explicit or implicit, organise teachers along continua related to the depth and purpose of data use, even when these dimensions are not clearly articulated by the original authors. The findings underscore that teachers' typological positioning is shaped not only by individual competence or disposition, but also by boundary conditions such as time, leadership support, data access, and professional learning opportunities. By clarifying patterns, limitations, and gaps across typological work, this review contributes a more coherent foundation for future theorisation, research design, and professional learning initiatives related to teachers' assessment data use.

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Conflict of Interest Statement
The authors declare that there is no conflict of interest regarding the publication of this study.

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