PANTAO
(International Journal of the Humanities and Social Sciences)
Volume 5, Issue 4
ISSN 3028-0877 | e-ISSN 3155-6043 | DOI 10.69651/2022PIJHSS

Assessment literacy in facilitation of evidence based science instruction: Achieving meaningful feedback and improve learners' achievement

Ms. Leilani R. Cosina, EdD*
Cebu Technological University-Main Campus, Cebu City, Philippines

ABSTRACT

This study determined the assessment literacy in Science instruction among Science teachers and school heads in selected public elementary schools in South District 1, DepEd Cebu City Division during the School Year 2026–2027 as the basis for the development of a Professional Development Program. Specifically, it described the profile of the respondents, determined the level of assessment literacy in terms of assessment planning and design, development and selection of assessment tools, administration and implementation of classroom assessments, interpretation and analysis of assessment results, and ethical use and communication of assessment information; assessed the extent of classroom assessment practices; examined the significant relationship between assessment literacy and classroom assessment practices; and identified the challenges and barriers encountered in assessment implementation. The study employed a descriptive-correlational research design involving seventy (70) school heads and Science teachers. Data were gathered using a researcher-made questionnaire and analyzed using frequency, percentage, weighted mean, standard deviation, ranking, and chi-square test. The findings revealed that assessment literacy was at a very high level, while classroom assessment practices were implemented to a very great extent. A significant relationship existed between assessment literacy and classroom assessment practices. Challenges identified included limited training, insufficient time, inadequate assessment resources, workload demands, and technology-related concerns. Based on the findings, a Professional Development Program was developed to strengthen assessment literacy and strategic classroom assessment practices in Science instruction.

Keywords: Assessment literacy, science instruction, classroom assessment practices, assessment practices, professional development program, strategic classroom assessment, descriptive-correlational research, Philippines.

Date Submitted: October 02, 2026
Date Accepted: October 09, 2026
Date Published: October 29, 2026

INTRODUCTION

Quality classroom assessment has become an indispensable component of effective teaching and learning because it provides teachers with meaningful evidence about learners' progress and guides instructional decision-making. As educational systems continue to shift

*Corresponding author / Email: leilani.cosina@deped.gov.ph
DOI: http://doi.org/10.69651/PIJHSS05041699

Recommended citation:
Cosina, L. R. (2026). Assessment literacy in facilitation of evidence based science instruction: Achieving meaningful feedback and improve learners' achievement. Pantao (International Journal of the Humanities and Social Sciences) 5 (4), 1860-1877. http://doi.org/10.69651/PIJHSS05041699

toward competency-based and learner-centered instruction, teachers are expected to possess sufficient assessment literacy to design, administer, interpret, and utilize assessments that accurately measure learners' achievement. Recent educational reforms have likewise emphasized that assessment should not merely focus on grading but should function as a continuous process that supports learning, provides constructive feedback, and improves instructional practices. Consequently, assessment literacy has emerged as one of the essential professional competencies that teachers must continuously develop to ensure the delivery of quality education.

Assessment literacy encompasses teachers' knowledge, skills, and professional judgment in planning assessments, selecting appropriate assessment tools, implementing classroom assessments, interpreting assessment data, and communicating assessment results ethically. Teachers who possess strong assessment literacy are more capable of aligning assessments with learning competencies and utilizing assessment evidence to improve instruction and learner achievement. Pastore (2023), in a systematic review of teacher assessment literacy, emphasized that although assessment literacy has become a major focus of educational research and policy, many teachers continue to experience difficulties in translating assessment theories into effective classroom practices. The review likewise highlighted the continuing need for sustained professional development to strengthen teachers' assessment competencies and support evidence-based instructional decision-making.

In Science education, classroom assessment plays an even more significant role because scientific learning requires learners to demonstrate conceptual understanding, scientific reasoning, inquiry skills, experimentation, and problem-solving abilities. These competencies cannot be adequately measured through traditional paper-and-pencil tests alone, making it necessary for Science teachers to employ a variety of valid and reliable assessment strategies. Effective Science assessment therefore depends largely on teachers' assessment literacy, particularly their ability to develop authentic assessment tasks, provide meaningful feedback, and utilize assessment results to improve classroom instruction. As educational standards continue to evolve, Science teachers are likewise expected to continuously update their assessment practices to respond to diverse learner needs and curriculum demands.

Within the Philippine educational context, assessment literacy has become increasingly important following the implementation of the K to 12 Basic Education Program and the MATATAG Curriculum, both of which emphasize competency-based teaching and classroom assessment. The Department of Education expects teachers to implement assessment practices that are aligned with curriculum standards while promoting learner development through formative and summative assessment. However, despite these policy directions, studies continue to report variations in teachers' assessment competencies. For instance, Malabo (2024) found that although Filipino basic education teachers generally demonstrated satisfactory assessment literacy, competencies related to data literacy and the interpretation of assessment results still required further enhancement. The study likewise recommended continuous professional development to strengthen teachers' assessment capabilities.

Although numerous international and local studies have investigated teacher assessment literacy and classroom assessment independently, relatively few have specifically examined the relationship between assessment literacy and classroom assessment practices among elementary Science teachers in Philippine public schools. Much of the existing literature has focused on general education teachers, pre-service teachers, or teachers from secondary schools and higher education institutions, leaving limited empirical evidence on how assessment literacy influences the day-to-day classroom assessment practices of elementary Science teachers. This gap limits the availability of context-specific information that school leaders may use in designing professional development initiatives that directly address teachers' assessment needs.

Moreover, there remains limited research focusing on teachers in individual school settings where assessment practices are influenced by institutional culture, learner characteristics, available resources, and professional development opportunities. Don Vicente Rama Memorial Elementary School, Basak Community Elementary School and Mangabon Elementary School are one of the public elementary schools in Cebu City, has continuously pursued quality instruction consistent with national educational reforms. However, no documented study has yet examined the assessment literacy of its science teachers and how such competencies relate to their classroom assessment practices. Conducting a localized investigation may therefore provide valuable baseline information that reflects the actual assessment competencies and professional needs of the school's Science teachers.

The findings of this study are expected to contribute to both educational research and professional practice by generating empirical evidence regarding the relationship between assessment literacy and classroom assessment practices. The results may assist school administrators in identifying teachers' strengths and areas requiring professional support, while also providing Science teachers with opportunities for reflection and continuous professional growth. Furthermore, the study may contribute to the implementation of the Philippine Professional Standards for Teachers by supporting evidence-based professional development programs that strengthen teachers' competencies in classroom assessment and ultimately improve learner achievement.

Therefore, the researcher conducted this study to determine the relationship between assessment literacy among science teachers and their classroom assessment practices at Don Vicente Rama Memorial Elementary School, Cebu City, Philippines, during the School Year 2026–2027. Specifically, the study generated empirical evidence that may serve as the basis for developing a Professional Development Program designed to strengthen teachers' assessment competencies, enhance classroom assessment practices, and support the continuous improvement of science instruction and learner achievement.

Statement of the problem

This study assessed the assessment literacy and classroom assessment practices in science among teachers in selected public elementary schools in South District 1, DepEd Cebu City Division, during the School Year 2026–2027, as a basis for developing a professional development program.

Specifically, it sought to answer the following questions:

1. What is the profile of the respondent groups in terms of age, gender, civil status, highest educational attainment, length of service, performance rating, and relevant training, seminars, and workshops attended?
2. As perceived by the respondent groups, what is the level of assessment literacy in science instruction in terms of assessment planning and design, development and selection of assessment tools, administration and implementation of classroom assessments, interpretation and analysis of assessment results, and ethical use and communication of assessment information?
3. What is the extent of classroom assessment practices among science teachers in terms of planning and alignment of assessments with learning competencies in science, particularly identifying science learning competencies, formulating learning objectives, aligning assessment tasks with learning competencies, selecting appropriate assessment methods and tools, and preparing assessment plans and blueprints, as well as utilization of formative assessment strategies, implementation of summative assessment practices,

provision of timely and constructive feedback, and utilization of assessment results to improve instruction and learner achievement?

4. Is there a significant relationship between science teachers' assessment literacy and their classroom assessment practices?
5. What challenges and barriers do teachers encounter in relation to their assessment literacy and classroom assessment practices?
6. Based on the findings of the study, what professional development program could be formulated?

METHODOLOGY

This section presented the methods and procedures employed in conducting the study. It described the research design, the flow of the study, the research environment, the respondents, the research instrument, the data gathering procedure, the statistical treatment of data, the scoring procedure, and the operational definitions of terms. These components served as the guide in determining the relationship between assessment literacy among science teachers and their classroom assessment practices at Don Vicente Rama Memorial Elementary School, Cebu City, Philippines, as the basis for developing a Professional Development Program.

The study employed the descriptive-correlational research design. Specifically, it described the respondents' profile, the level of assessment literacy among science teachers, the extent of their classroom assessment practices, and the challenges and barriers encountered in implementing effective classroom assessment practices. It also determined whether a significant relationship existed between science teachers' assessment literacy and their classroom assessment practices. This research design was appropriate because it examined the existing conditions of the study variables and their relationships without manipulating them, and the findings served as the basis for developing the proposed Professional Development Program.

The flow of the study was organized into input, process, and output, which were presented in a schematic diagram. The input of the study included the profile of the respondents in terms of age and gender, civil status, highest educational attainment, length of service, performance rating, and relevant training, seminars, and workshops attended. It also included the level of assessment literacy among science teachers in terms of assessment planning and design, development and selection of assessment tools, administration and implementation of classroom assessments, interpretation and analysis of assessment results, and ethical use and communication of assessment information. Moreover, the extent of classroom assessment practices in terms of planning and alignment of assessments with learning competencies, utilization of formative assessment strategies, implementation of summative assessment practices, provision of timely and constructive feedback, and utilization of assessment results to improve instruction and learner achievement, as well as the challenges and barriers encountered in implementing effective classroom assessment practices, also formed part of the study. The process involved the administration of a structured researcher-made questionnaire to the science teacher respondents. Prior to its administration, the instrument underwent validation by experts and reliability testing to ensure its validity and consistency. Upon securing the necessary approvals, the questionnaire was distributed to the respondents. The collected data were organized, tabulated, analyzed, and interpreted using appropriate statistical tools. Frequency and percentage were used to describe the respondents' profile and the challenges and barriers encountered. Weighted mean was employed to determine the level of assessment literacy and the extent of classroom assessment practices. An appropriate correlation analysis was utilized to determine the significant relationship between assessment

literacy and classroom assessment practices. The output of the study was a Professional Development Program designed to enhance science teachers' assessment literacy and strengthen their classroom assessment practices. The proposed program was based on the findings of the study and focused on improving teachers' competencies in assessment planning and design, development and selection of assessment tools, administration of classroom assessments, interpretation and utilization of assessment results, ethical assessment practices, and the effective use of assessment information to improve instruction and learner achievement.

The study was conducted at Don Vicente Rama Memorial Elementary School (DVRMES), formerly known as Basak Elementary School, which is one of the public elementary schools serving Cebu City South District I, together with Basak Community Elementary School (BCES) and Mangabon Elementary School (MES). These three schools serve learners from communities in the southern part of Cebu City and share a commitment to providing accessible, inclusive, and quality basic education. DVRMES is situated in Basak, Cebu City, near major barangays such as Mambaling, Punta Princesa, and Tisa. Its strategic location along a national highway makes it accessible to learners, teachers, parents, and other community stakeholders. Basak Community Elementary School, meanwhile, is located along Cabreros Street in Basak San Nicolas, Cebu City. Mangabon Elementary School likewise contributes to the district's efforts to extend educational services to children in its surrounding community. The location of the three schools was likewise presented in a map of the study area showing DVRMES, Mangabon Elementary School, and Basak Community Elementary School.

The leadership teams of DVRMES, BCES, and MES, including their school heads, teachers, and support personnel, work collaboratively to establish learning environments that promote academic excellence, learner well-being, discipline, and good citizenship. Recognizing that meaningful education extends beyond textbooks and classroom instruction, the schools encourage learners to participate in extracurricular and co-curricular activities. These may include sports, music, academic clubs, school organizations, environmental programs, and community-service initiatives. Such activities contribute to learners' holistic development by strengthening essential life skills such as teamwork, leadership, creativity, communication, and social responsibility. Among the three schools, DVRMES serves a particularly large and diverse learner population. It currently employs 129 dedicated teachers who attend to approximately 3,994 learners. The Grade 1 level consists of 17 sections with an average of 34 learners per class. Two of these sections are designated as science classes, each accommodating approximately 35 learners. These classes reflect the school's commitment to strengthening scientific literacy, critical thinking, inquiry, and problem-solving skills among young learners.

Basak Community Elementary School and Mangabon Elementary School complement the educational services provided by DVRMES. Although the three schools vary in population, available facilities, resources, and community context, they share the responsibility of addressing learners' academic, social, emotional, and developmental needs. Their presence within Cebu City South District I allows educational programs and interventions to reach learners from communities with different circumstances and learning requirements. The three schools strive to cultivate a culture of creativity, academic achievement, inclusivity, and respect. They recognize that learners come from diverse family backgrounds and may differ in their abilities, interests, experiences, and educational needs. Consequently, teachers endeavor to employ responsive and learner-centered strategies, provide appropriate interventions, and create safe and nurturing classrooms where every child feels valued, supported, and encouraged

to succeed. Parental and community involvement is also an essential component of the schools' learning environment. DVRMES, BCES, and MES seek to strengthen partnerships with parents, barangay officials, community organizations, and other stakeholders through meetings, workshops, school-improvement activities, community outreach, and volunteer programs. These partnerships help mobilize resources, address school and learner concerns, and promote shared responsibility for children's education. Despite differences in school size and context, DVRMES, Basak Community Elementary School, and Mangabon Elementary School are united by a common goal: to provide equitable, relevant, and quality education that enables every learner to grow academically, socially, emotionally, and morally. Through committed leadership, dedicated teachers, supportive families, and active community participation, the three schools continue to develop learning environments where children can thrive and become responsible, capable, and compassionate members of society.

The respondents of the study were the science teachers of Don Vicente Rama Memorial Elementary School, Cebu City, Philippines, during the School Year 2026–2027. They were selected through total enumeration since all science teachers in the school were included in the study to obtain comprehensive data on their assessment literacy and classroom assessment practices. The inclusion criteria were as follows: (a) the respondents were currently teaching Science at Don Vicente Rama Memorial Elementary School; (b) they had been teaching in the school for at least one school year; (c) they were directly involved in conducting classroom assessments as part of their teaching responsibilities; and (d) they voluntarily agreed to participate in the study. The distribution of the respondents showed that Don Vicente Rama Memorial Elementary School had 3 school heads and 32 teachers, for a frequency of 35, which represented 50.00% of the respondents. Basak Community Elementary School had 2 school heads and 28 teachers, for a frequency of 30, which represented 42.85%. Mangabon Elementary School had 1 school head and 4 teachers, for a frequency of 5, which represented 7.14%. In total, there were 6 school heads and 64 teachers, for a total frequency of 70, which represented 100.00% of the respondents.

The primary instrument used in this study was an adapted and researcher-modified questionnaire. The questionnaire was developed based on established assessment literacy and classroom assessment frameworks, relevant Philippine educational policies, and the instrument developed by Santos (2023) in the study entitled "Assessment Literacy and Classroom Assessment Practices of Junior High School Teachers in Central Visayas." Necessary modifications were made to align the questionnaire with the objectives, variables, indicators, and research setting of the present study. The questionnaire consisted of four parts. Part I gathered the profile of the respondents and was researcher-developed based on the demographic and professional variables identified in the Statement of the Problem. The profile variables included age and gender, civil status, highest educational attainment, length of service, performance rating, and relevant training, seminars, and workshops attended. The inclusion of professional development and training information was also consistent with the professional development orientation of the Philippine Professional Standards for Teachers (DepEd Order No. 42, s. 2017).

Part II determined the level of assessment literacy among science teachers. This section was adapted and researcher-modified from the assessment literacy instrument of Santos (2023), with the content dimensions further anchored on the assessment competencies identified in the Assessment Literacy Inventory of Mertler and Campbell (2005) and the assessment literacy standards emphasizing assessment design, administration, interpretation, use of results, communication, and ethical assessment practices. The items were organized into the following dimensions: assessment planning and design; development and selection of assessment tools; administration and implementation of classroom assessments; interpretation and analysis of assessment results; and ethical use and communication of assessment information. The items

ISSN 3028-0877 | e-ISSN 3155-6043 | DOI 10.69651/2022PIJHSS

were contextualized to Science instruction and the current classroom assessment policy framework of the Department of Education. Part III determined the extent of classroom assessment practices among science teachers. This section was adapted and researcher-modified from Santos (2023) and the Classroom Assessment Practices Questionnaire developed by Gonzales (2012), which conceptualized classroom assessment practices as activities ranging from assessment planning and administration to reporting and utilization of assessment results. The items were likewise aligned with the assessment principles and professional expectations reflected in DepEd Order No. 15, s. 2026 and DepEd Order No. 42, s. 2017. This section covered planning and alignment of assessments with learning competencies in Science, utilization of formative assessment strategies, implementation of summative assessment practices, provision of timely and constructive feedback, and utilization of assessment results to improve instruction and learner achievement. The section used a five-point Likert scale with the following responses: 5 (Very Great Extent), 4 (Great Extent), 3 (Moderate Extent), 2 (Less Extent), and 1 (Very Less Extent).

Part IV identified the challenges and barriers encountered by science teachers in implementing effective classroom assessment practices. This section was researcher-developed based on the assessment literacy and classroom assessment dimensions examined in Parts II and III, the assessment competencies reflected in Mertler and Campbell (2005), and the professional assessment expectations of the Philippine Professional Standards for Teachers under Domain 5: Assessment and Reporting. The items focused on possible challenges related to assessment planning and alignment, development and selection of assessment tools, administration of assessments, interpretation and utilization of assessment results, feedback provision, and the communication of assessment information. The section used a checklist with an option for respondents to specify other concerns not included in the list. The modified questionnaire was subjected to content validation by experts in educational research, educational assessment, Science education, and educational leadership to ensure its clarity, relevance, appropriateness, and alignment with the objectives of the study. It likewise underwent reliability testing to determine its internal consistency before its administration to the respondents. The information gathered from the instrument served as the basis for developing a Professional Development Program to strengthen science teachers' assessment literacy and classroom assessment practices.

In gathering the data, the researcher secured a formal letter of permission from the appropriate authorities before conducting the study at Don Vicente Rama Memorial Elementary School, Cebu City, Philippines. Upon approval, the researcher coordinated with the school head to identify the qualified science teacher respondents and schedule the administration of the questionnaire at a time convenient for the respondents without disrupting regular school activities. Prior to the administration of the instrument, the adapted and researcher-modified questionnaire underwent content validation by experts in educational research, educational assessment, Science education, and educational leadership. Necessary revisions were incorporated based on the validators' recommendations. The instrument also underwent reliability testing to establish its internal consistency before its final administration. Before data collection, the respondents were informed of the purpose of the study, and their informed consent was obtained. Participation was voluntary, and the confidentiality and anonymity of the respondents were strictly observed. The validated questionnaire was then administered to the science teachers, after which the accomplished questionnaires were retrieved, checked for completeness, and prepared for data processing. The collected data were organized, coded, tabulated, analyzed, and interpreted using the appropriate statistical tools. The findings were used to determine the relationship between assessment literacy among

science teachers and their classroom assessment practices, to identify the challenges and barriers encountered in implementing effective classroom assessment practices, and to serve as the basis for developing a Professional Development Program.

The data gathered from the respondents were subjected to appropriate statistical treatment consistent with the descriptive-correlational research design of the study. The statistical tools were used to describe the respondents' profile, determine the level of assessment literacy among science teachers, assess the extent of their classroom assessment practices, identify the challenges and barriers encountered, and determine the significant relationship between assessment literacy and classroom assessment practices. Frequency and percentage were used to describe the profile of the respondents in terms of age and gender, civil status, highest educational attainment, length of service, performance rating, and relevant training, seminars, and workshops attended. These statistical tools were also used to present the distribution of the challenges and barriers encountered by science teachers in implementing effective classroom assessment practices. Weighted mean was used to determine the level of assessment literacy among science teachers in terms of assessment planning and design, development and selection of assessment tools, administration and implementation of classroom assessments, interpretation and analysis of assessment results, and ethical use and communication of assessment information. It was also used to determine the extent of classroom assessment practices in terms of planning and alignment of assessments with learning competencies, utilization of formative assessment strategies, implementation of summative assessment practices, provision of timely and constructive feedback, and utilization of assessment results to improve instruction and learner achievement. The Pearson Product-Moment Correlation Coefficient (r) was used to determine whether a significant relationship existed between assessment literacy among science teachers and their classroom assessment practices.

The responses in Parts II and III of the questionnaires were scored using a five-point Likert scale. For Part II, which measured assessment literacy among science teachers, a weight of 5 corresponded to the range 4.21 - 5.00 and the response category Very High, which indicated that the teacher demonstrates an exceptional level of assessment literacy consistently in all situations. A weight of 4 corresponded to the range 3.41 – 4.20 and the response category High, which indicated that the teacher demonstrates a high level of assessment literacy in most situations. A weight of 3 corresponded to the range 2.61 – 3.40 and the response category Moderate, which indicated that the teacher demonstrates an adequate level of assessment literacy in some situations. A weight of 2 corresponded to the range 1.81 – 2.60 and the response category Low, which indicated that the teacher demonstrates a limited level of assessment literacy and requires improvement. A weight of 1 corresponded to the range 1.00 - 1.80 and the response category Very Low, which indicated that the teacher demonstrates minimal assessment literacy and requires extensive professional support. For Part III, which measured classroom assessment practices, a weight of 5 corresponded to the range 4.21 - 5.00 and the response category Very Great Extent, which indicated that classroom assessment practices are consistently demonstrated in almost all instructional situations. A weight of 4 corresponded to the range 3.41 – 4.20 and the response category Great Extent, which indicated that classroom assessment practices are demonstrated in most instructional situations. A weight of 3 corresponded to the range 2.61 – 3.40 and the response category Moderate Extent, which indicated that classroom assessment practices are demonstrated to a moderate extent with occasional inconsistencies. A weight of 2 corresponded to the range 1.81 – 2.60 and the response category Less Extent, which indicated that classroom assessment practices are demonstrated infrequently. A weight of 1 corresponded to the range 1.00 - 1.80 and the response category Very Less Extent, which indicated that classroom assessment practices are rarely demonstrated.

For better and clearer understanding of the study, some of the terms were operationally defined as they were used in the study. Challenges and barriers referred to the issues and concerns encountered by science teachers in implementing effective classroom assessment practices. Extent of classroom assessment practices referred to the degree to which science teachers implement effective classroom assessment practices in their instructional activities. Implementation of summative assessment practices referred to the conduct of assessments administered at the end of a lesson, unit, or grading period to evaluate learners' achievement of learning competencies. Planning and alignment of assessments with learning competencies referred to the process of designing assessments that are consistent with the prescribed learning competencies and intended learning outcomes. Provision of timely and constructive feedback referred to the practice of giving learners prompt, specific, and meaningful feedback to improve their learning and performance. Utilization of assessment results to improve instruction and learner achievement referred to the use of assessment findings to modify instructional strategies, address learners' needs, and enhance academic performance. Utilization of formative assessment strategies referred to the use of ongoing assessment techniques during instruction to monitor learners' progress and provide immediate support for learning. Level of assessment literacy referred to the degree of knowledge, skills, and competence demonstrated by science teachers in planning, developing, administering, interpreting, and communicating classroom assessments. Administration and implementation of classroom assessments referred to the process of conducting classroom assessments in a fair, organized, and consistent manner following established assessment procedures. Assessment planning and design referred to the process of developing assessment objectives, methods, and activities that are aligned with the intended learning competencies. Development and selection of assessment tools referred to the process of creating and choosing appropriate assessment instruments that accurately measure learners' achievement of the intended learning outcomes. Ethical use and communication of assessment information referred to the responsible, fair, and confidential use and reporting of assessment results to support learners' academic development. Interpretation and analysis of assessment results referred to the process of examining assessment data to determine learners' performance, identify learning needs, and guide instructional decisions. Professional Development Program referred to the proposed program designed to enhance science teachers' assessment literacy and strengthen their classroom assessment practices. Relevant information referred to the demographic and professional data of the teacher respondents necessary for describing their profile. Gender referred to the biological classification of the respondents as male or female. Highest educational attainment referred to the highest academic degree or level of education completed by the teacher respondents. Length of service referred to the total number of years the teacher respondents have been in the teaching profession. Relevant seminars and training referred to professional development activities attended by teachers related to reading instruction and literacy development.

RESULTS AND DISCUSSION

This chapter presents, analyzes, and interprets the data gathered from 70 respondents, composed of 6 school heads and 64 teachers, in selected public elementary schools in South District 1, Schools Division of Cebu City, during the School Year 2026–2027. The study employed a descriptive-correlational research design, and the respondents were drawn through total enumeration of all Science teachers and the school heads of the participating schools. Data were gathered through an adapted and researcher-modified questionnaire, and were analyzed using frequency and percentage, weighted mean, standard deviation, and a test of significant

relationship. The discussion is grounded in the data gathered, and the results are interpreted in direct relation to the objectives of the study, namely to describe the respondents' profile, determine the level of assessment literacy, determine the extent of classroom assessment practices, examine the relationship between the two variables, identify the challenges and barriers encountered, and provide a basis for the proposed Professional Development Program.

Profile of the respondents

In terms of age, the largest proportion of the 70 respondents belonged to the 31-40 years old bracket, with 26 respondents (37.14%), followed by the 41-50 years old bracket with 23 respondents (32.86%) and the 21-30 years old bracket with 15 respondents (21.43%). The smallest group, with 6 respondents (8.57%), was aged 51-60 years old (labeled in the age table as 50 years old above). The computed mean age was 39.66 years with a standard deviation of 8.68. This indicates a respondent group of varied ages concentrated among professionals who are already established in their careers, with experienced educators bringing practical insights and younger educators bringing updated knowledge of contemporary assessment approaches. Continuous professional growth among educators is emphasized in the Basic Education Development Plan 2030 (Department of Education, 2022) and in the Philippine Professional Standards for Teachers (Department of Education, 2020).

With respect to gender, 66 respondents (94.29%) were female and 4 respondents (5.71%) were male. This reflects the prevailing composition of the education workforce in many Philippine public schools, where women represent a dominant share of teaching and school leadership personnel. The Department of Education recognizes equal opportunities and inclusive participation among education personnel (Department of Education, 2022), and professional competence is shaped by training, experience, and continuous development rather than gender alone (Department of Education, 2020).

As to civil status, 58 respondents (82.86%) were married and 12 respondents (17.14%) were single, with no respondent identified as a widow or widower. This suggests that most participants have established family responsibilities and have developed experience in managing multiple obligations, qualities that may influence their engagement in instructional planning, assessment implementation, and professional development (Department of Education, 2020, 2022).

In terms of highest educational attainment, 60 respondents (85.72%) had units in a Master's Degree, 5 respondents (7.14%) held a Master's Degree, 4 respondents (5.71%) had units in a Doctorate Degree, and 1 respondent (1.43%) held a Doctorate Degree. No respondent was identified under the BSEd/BSSEd graduate category or other qualifications, so all participants had pursued or completed graduate-level studies. This reflects a strong commitment to professional advancement and exposure to current educational theories and assessment approaches (Department of Education, 2022).

Regarding length of service, 49 respondents (70.00%) had served for more than 6 years, 13 respondents (18.57%) for 4-6 years, and 8 respondents (11.43%) for 1-3 years, while none had served for less than a year. The respondent group is therefore largely composed of seasoned professionals, while the presence of less experienced educators creates opportunities for mentoring and underscores the need for sustained professional development (Department of Education, 2020, 2022).

On performance rating, 63 respondents (90.00%) were rated Very Satisfactory and 7 respondents (10.00%) were rated Outstanding. No respondent was classified as Satisfactory, Under Satisfactory, or Poor, which suggests that the participants possess the professional capacity to engage in assessment-related practices and learning activities (Department of Education, 2020, 2022).

Regarding the highest level of relevant training, seminars, and workshops attended, 51 respondents (72.86%) participated at the district level, ranking first, followed by 12 respondents (17.14%) at the division level, 5 respondents at the regional level, and 2 respondents at the national level, while 0 respondents attended international-level activities. Most professional learning experiences were therefore concentrated in localized, school system-based capacity-building activities, which highlights the importance of more extensive programs on advanced assessment competencies in science instruction (Department of Education, 2020, 2022).

Taken together, the majority of the respondents were within the 31-40 years old bracket, predominantly female, mostly married, largely holders of units in a Master's Degree, mostly with more than 6 years of service, and mostly rated Very Satisfactory. They are qualified, experienced, and professionally engaged educators, which provides a strong basis for examining assessment literacy and classroom assessment practices and for formulating responsive professional development initiatives (Department of Education, 2020, 2022).

Level of assessment literacy among science teachers

Assessment literacy was interpreted using the scale in which 4.21 - 5.00 is Very High, 3.41 - 4.20 is High, 2.61 - 3.40 is Moderate, 1.81 - 2.60 is Low, and 1.00 - 1.80 is Very Low. For assessment planning and design, school heads and teachers rated the alignment of assessment objectives with intended Science learning competencies at a weighted mean of 4.63 (SD = 0.49) and 4.51 (SD = 0.53), the identification of appropriate assessment methods during lesson planning at 4.57 (SD = 0.50) and 4.46 (SD = 0.55), the design of tasks measuring different levels of understanding at 4.49 (SD = 0.54) and 4.38 (SD = 0.58), the reflection of expected curriculum outcomes in assessment activities at 4.60 (SD = 0.51) and 4.48 (SD = 0.54), and the consideration of learners' diverse abilities and needs at 4.43 (SD = 0.57) and 4.32 (SD = 0.61). All items were interpreted as Very High, with grand means of 4.54 (SD = 0.52) for school heads and 4.43 (SD = 0.56) for teachers. These results indicate that assessment planning is an integral part of instruction, linking curriculum standards, classroom activities, and learner assessment, consistent with the emphasis on curriculum alignment in the Basic Education Development Plan 2030 (Department of Education, 2022). The findings support Bautista and Ramos (2021), who reported that teachers with higher assessment literacy design assessment activities aligned with instructional objectives and learner needs. The attention to different levels of understanding is consistent with competency-based education (Department of Education, 2021), and the consideration of learner diversity agrees with Garcia and Villanueva (2023), who noted that assessment-literate teachers develop flexible and responsive approaches.

For development and selection of assessment tools, school heads and teachers rated the appropriateness of tools for intended learning outcomes at 4.59 (SD = 0.50) and 4.48 (SD = 0.54), accurate measurement of intended knowledge, skills, and competencies at 4.54 (SD = 0.52) and 4.42 (SD = 0.57), the use of varied formats at 4.46 (SD = 0.56) and 4.36 (SD = 0.60), the development of rubrics and scoring guides for performance-based assessments at 4.41 (SD = 0.58) and 4.31 (SD = 0.62), and the review of tools for validity, clarity, and fairness before administration at 4.57 (SD = 0.51) and 4.45 (SD = 0.55). All items were interpreted as Very High, with grand means of 4.51 (SD = 0.53) and 4.40 (SD = 0.58). This shows that tool development and selection are established practices that provide accurate evidence for instructional decisions (Department of Education, 2022). The attention to accuracy and validity agrees with Mendoza and Flores (2021), who emphasized that teachers with stronger

assessment literacy develop more valid measures. The use of varied formats aligns with learner-centered, competency-based assessment (Department of Education, 2021), and the very high ratings on rubrics are consistent with Santos and Reyes (2023), who found that well-developed criteria enhance objective judgments and the quality of feedback.

For administration and implementation of classroom assessments, school heads and teachers rated the clear explanation of procedures at 4.61 (SD = 0.49) and 4.50 (SD = 0.53), conduct according to established guidelines at 4.63 (SD = 0.48) and 4.52 (SD = 0.52), testing conditions promoting fairness and equal opportunities at 4.55 (SD = 0.52) and 4.44 (SD = 0.56), consistent and objective administration at 4.59 (SD = 0.50) and 4.47 (SD = 0.54), and the provision of appropriate accommodations at 4.46 (SD = 0.56) and 4.35 (SD = 0.60). All items were interpreted as Very High, with grand means of 4.57 (SD = 0.51) and 4.46 (SD = 0.55). Clear communication of procedures minimizes confusion and yields more accurate evidence of learning (Department of Education, 2022), and adherence to guidelines supports the finding of Villareal and Manalo (2021) that stronger assessment literacy is associated with greater consistency in implementation. The emphasis on fairness reflects inclusive and responsive practices highlighted by the Department of Education (2021), and the provision of accommodations is consistent with Navarro and Garcia (2023), who noted that assessment-literate teachers implement flexible strategies responsive to diverse learners.

For interpretation and analysis of assessment results, school heads and teachers rated accurate interpretation to determine learner achievement at 4.62 (SD = 0.49) and 4.51 (SD = 0.53), analysis to identify strengths and learning gaps at 4.59 (SD = 0.50) and 4.48 (SD = 0.55), the use of findings to evaluate instructional strategies at 4.54 (SD = 0.52) and 4.43 (SD = 0.57), the examination of performance trends at 4.50 (SD = 0.54) and 4.39 (SD = 0.58), and the use of results as a basis for instructional decision-making at 4.63 (SD = 0.48) and 4.52 (SD = 0.52). All items were interpreted as Very High, with grand means of 4.58 (SD = 0.51) and 4.47 (SD = 0.55). Assessment data are thus viewed as sources of information for improving Science instruction, in line with data-informed instruction (Department of Education, 2022). The analysis of strengths and gaps supports Castillo and Ramos (2021), who emphasized that strong assessment literacy helps teachers use evidence to guide instructional adjustments, the evaluation of strategies reflects the reflective practice highlighted by the Department of Education (2021), and the examination of trends agrees with Villanueva and Santos (2023) on responsive decision-making.

For ethical use and communication of assessment information, school heads and teachers rated accurate communication of results to learners and parents at 4.66 (SD = 0.47) and 4.54 (SD = 0.51), maintenance of confidentiality of records at 4.71 (SD = 0.45) and 4.61 (SD = 0.49), fair and unbiased decisions at 4.63 (SD = 0.49) and 4.52 (SD = 0.53), respectful and professional communication at 4.69 (SD = 0.46) and 4.58 (SD = 0.50), and responsible use of results to support academic development at 4.72 (SD = 0.44) and 4.60 (SD = 0.49). All items were interpreted as Very High, with grand means of 4.68 (SD = 0.46) and 4.57 (SD = 0.50). Ethical principles are therefore strongly integrated into assessment practice, consistent with the Department of Education's emphasis on meaningful feedback and stakeholder engagement (Department of Education, 2022). The confidentiality ratings support Hernandez and Cruz (2021), the emphasis on fairness and professionalism reflects the Philippine Professional Standards for Teachers (Department of Education, 2020), and the view of assessment as a tool for improvement agrees with Ramirez and Bautista (2023).

In summary, all five dimensions were interpreted as Very High. School heads and teachers respectively rated assessment planning and design at 4.54 (SD = 0.52) and 4.43 (SD = 0.56), development and selection of assessment tools at 4.51 (SD = 0.53) and 4.40 (SD = 0.58), administration and implementation at 4.57 (SD = 0.51) and 4.46 (SD = 0.55), interpretation and analysis at 4.58 (SD = 0.51) and 4.47 (SD = 0.55), and ethical use and communication at

ISSN 3028-0877 | e-ISSN 3155-6043 | DOI 10.69651/2022PIJHSS

4.68 (SD = 0.46) and 4.57 (SD = 0.50), with an overall grand mean of 4.58 (SD = 0.51) for school heads and 4.47 (SD = 0.55) for teachers. Ethical use and communication obtained the highest rating from both groups, which builds trust among teachers, learners, and parents (Department of Education, 2022). The very high ratings on interpretation and analysis reflect the use of data beyond recording grades (Brookhart, 2021), those on administration reflect consistent application of standards in science, where conceptual understanding and scientific processes are essential (Department of Education, 2021), and those on planning and tool development agree with DeLuca et al. (2021) on valid, reliable, and meaningful classroom assessments.

Extent of classroom assessment practices

Classroom assessment practices were interpreted using the scale in which 4.21 - 5.00 is Very Great Extent, 3.41 - 4.20 is Great Extent, 2.61 - 3.40 is Moderate Extent, 1.81 - 2.60 is Less Extent, and 1.00 - 1.80 is Very Less Extent. For planning and alignment of assessments with learning competencies, school heads and teachers rated the alignment of assessments with prescribed Science competencies at 4.61 (SD = 0.49) and 4.52 (SD = 0.52), the reflection of intended lesson outcomes at 4.58 (SD = 0.50) and 4.49 (SD = 0.54), the sequencing of tasks based on instructional objectives at 4.54 (SD = 0.52) and 4.43 (SD = 0.56), the use of competencies as the basis for selecting methods at 4.60 (SD = 0.50) and 4.50 (SD = 0.53), and the measurement of intended cognitive skills at 4.56 (SD = 0.51) and 4.45 (SD = 0.55). All items were interpreted as Very Great Extent, with grand means of 4.58 (SD = 0.50) and 4.48 (SD = 0.54). Assessment planning is thus treated as an essential part of instructional preparation, consistent with the emphasis on curriculum-based assessment (Department of Education, 2022). The use of competencies in selecting methods agrees with Paterno and Garcia (2021), who emphasized that alignment enhances validity and effectiveness, and the attention to sequencing and cognitive demand supports competency-based learning (Department of Education, 2021).

For utilization of formative assessment strategies, school heads and teachers rated the regular integration of formative techniques at 4.59 (SD = 0.50) and 4.48 (SD = 0.54), classroom questioning at 4.63 (SD = 0.48) and 4.52 (SD = 0.52), classroom observations at 4.54 (SD = 0.52) and 4.44 (SD = 0.56), continuous monitoring of performance at 4.60 (SD = 0.49) and 4.50 (SD = 0.53), and immediate instructional adjustments at 4.57 (SD = 0.51) and 4.46 (SD = 0.55). All items were interpreted as Very Great Extent, with grand means of 4.59 (SD = 0.50) and 4.48 (SD = 0.54). Formative assessment has become an essential component of instruction, supporting assessment for learning (Department of Education, 2022). The use of questioning agrees with Santos and Villanueva (2021), who identified it as a significant source of real-time information, continuous monitoring aligns with responsive, learner-centered approaches (Department of Education, 2021), and the use of results for immediate adjustments supports Reyes and Dela Cruz (2023).

For implementation of summative assessment practices, school heads and teachers rated administration at appropriate points during instruction at 4.56 (SD = 0.51) and 4.45 (SD = 0.55), accurate measurement of achievement of competencies at 4.60 (SD = 0.50) and 4.49 (SD = 0.54), the use of various forms at 4.48 (SD = 0.54) and 4.38 (SD = 0.58), consistent application of scoring procedures at 4.62 (SD = 0.48) and 4.51 (SD = 0.52), and accurate documentation of results at 4.64 (SD = 0.47) and 4.53 (SD = 0.51). All items were interpreted as Very Great Extent, with grand means of 4.58 (SD = 0.50) and 4.47 (SD = 0.54). Appropriate timing supports valid measurement and reflects the balance between assessment of learning

and assessment for learning (Department of Education, 2022). The accurate measurement of competencies agrees with Cruz and Manalo (2021), varied forms support a comprehensive and fair evaluation (Department of Education, 2021), and systematic documentation is consistent with Garcia and Reyes (2023).

For provision of timely and constructive feedback, school heads and teachers rated feedback within an appropriate period at 4.58 (SD = 0.50) and 4.47 (SD = 0.54), feedback identifying strengths and areas for improvement at 4.61 (SD = 0.49) and 4.50 (SD = 0.53), feedback encouraging future improvement at 4.63 (SD = 0.48) and 4.52 (SD = 0.52), feedback that is specific, objective, and aligned with criteria at 4.57 (SD = 0.51) and 4.46 (SD = 0.55), and respectful and supportive communication at 4.65 (SD = 0.47) and 4.54 (SD = 0.51). All items were interpreted as Very Great Extent, with grand means of 4.61 (SD = 0.49) and 4.50 (SD = 0.53). Feedback is used as a strategy for continuous learning and not merely for reporting performance (Department of Education, 2022). The descriptive, improvement-oriented feedback agrees with Villamor and Santos (2021), the motivational use of feedback is consistent with learner-centered approaches (Department of Education, 2021), and the supportive tone supports Reyes and Bautista (2023) on engagement and self-regulated learning.

For utilization of assessment results to improve instruction and learner achievement, school heads and teachers rated the modification of instructional strategies at 4.60 (SD = 0.50) and 4.49 (SD = 0.54), the planning of remediation and enrichment at 4.57 (SD = 0.51) and 4.46 (SD = 0.55), instructional decisions based on assessment performance at 4.63 (SD = 0.48) and 4.52 (SD = 0.52), monitoring of academic progress over time at 4.59 (SD = 0.50) and 4.48 (SD = 0.54), and the contribution of results to improved science achievement at 4.65 (SD = 0.47) and 4.54 (SD = 0.51). All items were interpreted as Very Great Extent, with grand means of 4.61 (SD = 0.49) and 4.50 (SD = 0.53). This reflects responsiveness to learner performance and data-driven instruction (Department of Education, 2022). The planning of remediation and enrichment supports Flores and Mendoza (2021), evidence-based decision-making is essential to effective practice (Department of Education, 2021), and progress monitoring agrees with Ramirez and Cruz (2023).

In summary, all five dimensions were interpreted as Very Great Extent. School heads and teachers respectively rated planning and alignment at 4.58 (SD = 0.50) and 4.48 (SD = 0.54), formative assessment at 4.59 (SD = 0.50) and 4.48 (SD = 0.54), summative assessment at 4.58 (SD = 0.50) and 4.47 (SD = 0.54), feedback at 4.61 (SD = 0.49) and 4.50 (SD = 0.53), and utilization of results at 4.61 (SD = 0.49) and 4.50 (SD = 0.53). The summary table reports grand means of 4.49 (SD = 0.50) for school heads and 4.49 (SD = 0.54) for teachers, also interpreted as Very Great Extent. Feedback and utilization of results obtained the highest ratings from both groups, indicating that respondents see feedback and assessment information as essential tools for improving learner performance (Department of Education, 2022). The strong formative ratings align with the principles of assessment for learning (Department of Education, 2021), and the summative ratings suggest that summative assessments serve as sources of information on achievement and instructional effectiveness and not only for grading. Overall, the consistent ratings reflect strong assessment competencies and strategic classroom practices (Department of Education, 2020, 2022).

Relationship between assessment literacy and classroom assessment practices

The test of significant relationship between assessment literacy in science instruction and classroom assessment practices among science teachers yielded a computed chi-square value of 0.76 with a p-value of 0.001, tested at the 0.05 level of significance. Because the p-value was lower than the level of significance, the null hypothesis was rejected, and the relationship was interpreted as significant. This means that teachers' knowledge,

understanding, and competencies in assessment are associated with how effectively they implement assessment strategies in science instruction. The finding supports Clores and Reganit (2020), who revealed that assessment literacy influences the understanding and application of assessment processes in Philippine contexts, and Schneider et al. (2021), who emphasized that assessment literacy is closely connected with teachers' confidence and actual assessment practices. It also agrees with Latif (2021), who noted that teachers' assessment-related knowledge and skills contribute to the successful integration of assessment for learning. Assessment literacy thus extends beyond knowledge of tools to the strategic application of assessment information, including designing competency-based assessments, analyzing learner responses, identifying misconceptions, and providing interventions, and effective assessment requires alignment among assessment purposes, instructional decisions, and learner outcomes (Chala, 2021). Strengthening assessment competencies is therefore essential to more responsive, evidence-based, and learner-centered classroom practices.

Challenges and barriers

Among the 70 respondents, the most frequently identified challenges, each with a frequency of 65 and ranked first, were limited training on classroom assessment and assessment literacy, insufficient time to develop quality assessment tools, and insufficient instructional materials and assessment resources. Heavy teaching workload affecting assessment preparation and implementation ranked fourth with a frequency of 64, and limited access to digital technologies and assessment platforms ranked fifth with 63. Difficulty in designing assessments that align with learning competencies ranked sixth with 60. Limited skills in constructing valid and reliable assessment instruments, large class size that limits assessment and monitoring, and diverse learning needs and abilities that make assessment more challenging each had a frequency of 58 and shared the seventh rank. Challenges in interpreting and analyzing assessment results ranked tenth with 45, difficulty in providing timely and constructive feedback ranked eleventh with 39, and difficulty in developing performance-based assessment tasks and rubrics ranked twelfth with 30. Although respondents showed very high assessment literacy and practice, continuous professional development, adequate preparation time, and sufficient resources remain essential. Workload may limit capacity to design, administer, and analyze assessments, which calls for institutional support (Department of Education, 2022), and limited digital access constrains technology-supported assessment (Department of Education, 2021). The concerns on alignment and instrument construction show a need for further technical skills, and professional learning strengthens valid, competency-based assessments (DeLuca et al., 2021). Class size and learner diversity make individualized support and feedback difficult, and even the least frequent concern, performance-based tasks and rubrics, still reflects a need for authentic assessment of higher-order thinking and scientific skills.

Synthesis

In sum, the 70 respondents, who were largely experienced, highly qualified, and rated Very Satisfactory or Outstanding, demonstrated Very High assessment literacy across all five dimensions and implemented classroom assessment practices to a Very Great Extent. The relationship between the two variables was significant (chi-square = 0.76, $p = 0.001$, rejected at the 0.05 level), confirming that stronger assessment literacy accompanies stronger practice. Yet the high frequencies on limited training, time, resources, workload, and digital access (65,

65, 65, 64, and 63) show that capacity is constrained by conditions that professional development can address. These findings address each research objective, contribute evidence from the Philippine public elementary science context, and provide the empirical basis for the Professional Development Program presented in the next chapter.

CONCLUSION

The study concluded that science teachers and school heads in the selected public elementary schools of South District 1, DepEd Cebu City Division, possess a very high level of assessment literacy. This was evident across all dimensions, with the ethical use and communication of assessment information rated highest, followed by the interpretation and analysis of assessment results, the administration and implementation of classroom assessments, assessment planning and design, and the development and selection of assessment tools. The respondents were mostly female, married, and within the middle-adulthood age bracket. Most had earned units in the master's degree program, had more than six years of professional experience, obtained a Very Satisfactory performance rating, and had attended district-level trainings, seminars, and workshops. Taken together, these characteristics suggest that considerable professional experience and sustained exposure to continuing professional development have contributed to the strong competence of the respondents in planning, developing, implementing, interpreting, and ethically utilizing assessment information to support science instruction.

The study further concluded that classroom assessment practices among the respondents were carried out to a very great extent across all dimensions. The provision of timely and constructive feedback and the utilization of assessment results to improve instruction and learner achievement obtained the highest ratings, followed by the utilization of formative assessment strategies, the planning and alignment of assessments with learning competencies, and the implementation of summative assessment practices. These results indicate that science teachers consistently apply assessment practices that are aligned with curriculum expectations and responsive to the academic needs of learners. Such practices promote evidence-based instruction, meaningful feedback, and improved learner achievement in science.

Building on these results, the significant relationship found between assessment literacy and classroom assessment practices confirms that the assessment competencies of educators influence how effectively assessments are planned, administered, analyzed, and utilized. Teachers and school heads with stronger assessment literacy are therefore more capable of implementing effective classroom assessment practices. This finding underscores that assessment knowledge, skills, and understanding contribute to the development of strategic assessment practices that support instructional improvement and learner achievement, and that assessment literacy serves as an essential foundation for effective assessment implementation, instructional decision-making, and learner support.

Despite these strengths, the respondents identified several challenges that constrain the effective implementation of classroom assessment practices. The most frequently reported concerns were limited training on classroom assessment and assessment literacy, insufficient time to develop quality assessment tools, insufficient instructional materials and assessment resources, heavy teaching workload, and limited access to digital technologies and assessment platforms. Other difficulties included designing aligned assessments, constructing valid and reliable assessment instruments, interpreting assessment results, providing feedback, and addressing diverse learner needs. These challenges related to training, workload, resources, technology, and learner diversity highlight the need for sustained professional support and strategic interventions, even among educators who demonstrate strong assessment capabilities.

In light of these conclusions, it is recommended that science teachers and school heads continue strengthening their assessment literacy through continuous professional development focused on assessment design, data interpretation, feedback strategies, and ethical assessment practices. School administrators and education stakeholders are encouraged to provide sustained technical assistance, adequate assessment resources, digital support, and opportunities for collaborative learning communities to address the identified challenges. A professional development program may also be developed and implemented to further enhance strategic classroom assessment practices. Finally, future researchers may explore related variables and conduct similar studies in wider educational contexts to strengthen the existing findings, thereby contributing to the continued improvement of assessment practices in science instruction.

REFERENCES

Department of Education. (2015). DepEd Order No. 8, s. 2015: Policy guidelines on classroom assessment for the K to 12 Basic Education Program.

Department of Education. (2024). DepEd Order No. 10, s. 2024: Policy guidelines on the implementation of the MATATAG curriculum.

Department of Education. (2017). DepEd Order No. 42, s. 2017: National adoption and implementation of the Philippine Professional Standards for Teachers (PPST).

Department of Education. (2013). Republic Act No. 10533 (Enhanced Basic Education Act of 2013).

Alonzo, A. C., Wooten, M. M., & Christensen, J. (2022). Learning progressions as a simplified model: Examining teachers' reported uses to inform classroom assessment practices. Science Education, 106(4), 852–889. https://doi.org/10.1002/sce.21713

Alonzo, D. (2020). Teacher education and professional development in Industry 4.0: The case for building a strong assessment literacy. In Teacher education and professional development in Industry 4.0. CRC Press.

Black, P., & Wiliam, D. (1998). Assessment and classroom learning. Assessment in Education: Principles, Policy & Practice, 5(1), 7–74. https://doi.org/10.1080/0969595980050102

Bloom, B. S. (1968). Learning for mastery. Center for the Study of Evaluation of Instructional Programs.

Gan, L., & Lamb, R. (2022). A review on language assessment literacy: Trends, foci and contributions. Language Assessment Quarterly, 19(5), 503–525. https://doi.org/10.1080/15434303.2022.2128802

Hannigan, C., Alonzo, D., & Oo, C. Z. (2022). Student assessment literacy: Indicators and domains from the literature. Assessment in Education: Principles, Policy & Practice, 29(4), 482–504. https://doi.org/10.1080/0969594X.2022.2121911

Piaget, J. (1952). The origins of intelligence in children. International Universities Press.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.

Weng, F., & Shen, B. (2022). Language assessment literacy of teachers. Frontiers in Psychology, 13, Article 864582. https://doi.org/10.3389/fpsyg.2022.864582

Alonzo, D. (2016). Development and application of a Teacher Assessment for Learning (AfL) Literacy Tool [Doctoral dissertation].