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From Verbs to Validity: Developing the Wheel for Integrated Scaffolded Evaluation through CEFR and Bloom Linked Reference (WISE-CB)

[*]Amer Fawwaz Mohamad Yasid[1], Nurul Kamalia Yusuf[2], Raja Mayang Delima Mohd Beta[3]
**Faculty of Administrative Science and Policy Studies, Universiti Teknologi MARA Cawangan Negeri Sembilan, Kampus Seremban*
Academy of Language Studies, Universiti Teknologi MARA Cawangan Negeri Sembilan, Kampus Seremban
Faculty of Business and Management, Universiti Teknologi MARA Cawangan Negeri Sembilan, Kampus Seremban

amerfawwaz@uitm.edu.my[1], nurulkamalia@uitm.edu.my[2], drmayang@uitm.edu.my[3]
***Corresponding Author**

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ABSTRACT

Bloom's Taxonomy (BT) has been an important part of designing assessments in higher education for a long time. It offers a coherent method for mapping assessment items to specific learning domains or different areas of learning. However, some lecturers continue to have difficulties in its successful application, frequently resulting in examinations that inadequately align with students' language preparedness or cognitive abilities. To tackle this problem, this study presents the Bloom's Taxonomy–CEFR Reference Kit (WISE-CB), a novel instrument aimed at improving the ability to assess and minimising discrepancies in exam development across higher education programs. The study utilised a qualitative content analysis, bolstered by an extensive literature survey, which incorporated educational taxonomies, lexical frameworks, and psycholinguistic components. The research design unfolded in five phases: (1) identification of BT verbs from foundational and contemporary sources; (2) integration of these verbs with CEFR vocabulary levels (A1–C2) to ensure linguistic appropriateness for diploma, undergraduate, and postgraduate learners; (3) evaluation of verb suitability using Cognitive Load Theory to balance working memory demands with task complexity; (4) expert classification and validation by instructional design and English Language Teaching specialists; and (5) development of the Reference Kit, visually represented as a wheel, to serve as a practical scaffold for lecturers in exam question design. The results show that connecting Bloom's cognitive domains with CEFR levels and cognitive load considerations in a systematic way is a new addition. The Reference Kit offers a proven, reproducible framework for higher education lecturers by placing assessment verbs within both cognitive and language dimensions. This invention improves assessment practices, encourages fair testing for students with different levels of skill, and pushes for new ways to instruction in higher education.

Keywords: *Bloom's Taxonomy, Higher Education Assessment, CEFR (Common European Framework of Reference), Cognitive Load Theory, Assessment Innovation*

1 INTRODUCTION

Continuous assessment is extensively utilised in higher education to monitor student learning throughout the semester. Nonetheless, the final examination persists as one of the most common and conventional methods of evaluation in universities globally. In Malaysia, final examinations are compulsory at public universities, including Universiti Teknologi MARA (UiTM), and are often conducted in written format, contingent upon the discipline and program. Formulating good exam questions needs both topic mastery and the ability to align questions with suitable levels of cognitive complexity. Bloom's Taxonomy, created by Benjamin Bloom, has been widely utilised as a framework for developing examination questions at both undergraduate and postgraduate levels. Despite its prevalent application, issues persist in guaranteeing that exam questions constantly correspond with the designated learning outcomes and students' actual competence levels. Research and internal evaluations reveal that certain lecturers have difficulties in the proper implementation of Bloom's Taxonomy, leading to questions that are either excessively linguistically challenging or misaligned with the designated cognitive domain. This challenge is exacerbated by insufficient training and the lack of systematic tools that link cognitive complexity with language accessibility (Sulaiman et al., 2025)

Current tools and frameworks have advanced in tackling this junction. The L-TRU framework, an adaptation of Schoenfeld's TRU framework, emphasises the interaction between cognitive demand and language support across five dimensions: Mathematical Richness, Cognitive Demand, Equitable Access, Agency, and Use of Student Contributions (Prediger & Neugebauer, 2020; Neugebauer & Prediger, 2022). L-TRU, albeit valuable, largely focusses on mathematics education and does not immediately apply to larger exam design methods across higher education fields. Research in foreign language teaching indicates that digital tools and cognitive methods can improve memory, attention, and motivation while alleviating cognitive load (Broda, 2025; Gennari, 2025; Abad-Castro, 2025). These findings emphasise the necessity of integrating assessment design with cognitive and language support, albeit they remain disjointed and specific to particular disciplines.

Neurolinguistic research substantiates that cognitive load directly affects language processing in the brain, with differing demands either enhancing or obstructing comprehension based on learner proficiency (Mofrad & Schiller, 2019; Kuhlen & Rahman, 2023). In practice, higher-order cognitive demands are frequently inadequately represented in English language instruction materials and assessments (Glušac et al., 2019; Xie, 2024), creating a disparity between theoretical insights and classroom realities. These studies collectively indicate that, despite the existence of frameworks and methodologies, there is no cohesive, practical, and scalable instrument that systematically integrates Bloom's Taxonomy, CEFR language levels, and cognitive load considerations for the design of assessments in higher education. This study fills the void by presenting the Bloom's Taxonomy–CEFR Reference Kit, a proven and practical instrument intended to assist higher education instructors in test formulation. The kit integrates Bloom's cognitive domains with CEFR vocabulary levels and Cognitive Load Theory, offering a structured, replicable framework for instructors to create exam questions that are cognitively demanding and linguistically comprehensible. This invention enhances assessment literacy, fosters equity for learners with diverse proficiency levels, and improves pedagogical methods in higher education.

1.1 Research Objective

1. To determine which verbs in Bloom's Taxonomy are acceptable for students' linguistic and cognitive levels by classifying them according to cognitive levels and matching them to CEFR competence bands (A1-C2).

2. To create and verify a Bloom's Taxonomy-CEFR Reference Kit that helps instructors at UiTM create test questions that strike a balance between cognitive load, vocabulary accessibility, and cognitive demand.

2 LITERATURE REVIEW

The design of assessments in higher education should go beyond the evaluation of learning outcomes. Assessment design should demand involvement of the learner's thought processes and flexibility. The combination of Bloom's Taxonomy, the CEFR, and CLT offers a rich basis for designing assessments that aim to meet the diverse needs of learners. This review brings together essential theories and contemporary studies (2020-2025) to illuminate their use, approaches, and consequences for equitable assessment practices.

2.1 Bloom's Taxonomy in Exam Design

Bloom's Taxonomy was created by Benjamin Bloom in 1956 and identifies the cognitive skills in levels that range from lower to higher order skills.

		THE KNOWLEDGE DIMENSION			
THE COGNITIVE PROCESS DIMENSION		Metacognitive	Procedural	Conceptual	Factual
	Remember	Recall	Recognise	List	Remember
	Understand	Predict	Clarify	Classify	Summarise
	Apply	Use	Carry Out	Provide	Respond
	Analyse	Deconstruct	Integrate	Differenciate	Select
	Evaluate	Reflect	Judge	Determine	Check
	Create	Create	Design	Assemble	Generate

Figure 1 The Revised Bloom's Taxonomy
Source: Adapted from Munzenmaier & Rubin, 2013, p. 22

The Revised Bloom's Taxonomy is more comprehensive to describe the levels of learning. This is because learning is classified into levels through two dimensions which are types of knowledge and cognitive process. According to Munzenmaier and Rubin (2013), the revision of the taxonomy is significant to reconsider the value of the taxonomy in the development of accountable programmes, the alignment of curriculums, and the design of assessments. Moreover, Munzenmaier and Rubin (2013) state that it is important to revise the original taxonomy based on new learning understanding and new instructional methods. Since the use of online instructional games has increasingly gained interest for learning, the Revised Bloom's Taxonomy is notably applicable for this new learning approach that takes place in the new learning environment which occurs virtually. Bloom's Taxonomy has been used in teaching and learning pedagogy for a long time, and has a diverse and extensive use in exam creation. More and more studies now illustrate its use in different fields.

2.2 Applications in Assessment Design

2.2.1 Question Design

Assessments in the Bloom's framework can range from the most basic cognitive processes of remembering to more complex one of creating (Pizà-Mir, 2022; Abdulrahman, 2023) (Abdulrahman, 2023; (Gani et al., 2022). Research shows that assessments that aim to test higher order thinking skills improve critical thinking and performance in academic work Abdulrahman, 2023.

2.2.2 Automated Tools

The creation and growth of technology have led to the availability of automated classification tools aimed at categorizing exam questions according to Bloom's taxonomy.

As an example, Gani et al. (2022) used machine learning techniques for classifying exam questions, which made the construction of exam papers at various cognitive levels more efficient. Though, the varying levels of experience and belief as to the effectiveness of the tools used raise barriers to the use of these tools (Baharuddin & Naufal, 2023). Evidence of Recent Research A systematic review by Pizà-Mir (2022) stated that assessments based on Bloom's Taxonomy proved to be more engaging and satisfying for students than traditional assessment methods. Reports also suggest that more refined assessments positively impact learning outcomes for students across various disciplines such as STEM and the humanities (Abdulrahman, 2023; Baharum et al., 2021, Zhongyao et al., 2024). Recent scholarly work has shed more light on the use of Bloom's Taxonomy for exam construction, highlighting its enhancement of cognitive activities and the overall learning outcomes. This section centres on assessing the most recent research from the last few years which has prepared ground-breaking findings on the practical application of Bloom's increases cognitive processes framework toward educational assessments. Effective Questioning Strategies Doðan et al. (2023) studied the processes whereby pre-service teachers of English Language Teaching (ELT) engage Bloom's Taxonomy and questioning at the same time.

The research showed that although most teachers recognized how crucial it was to include higher-order questioning, there was a great deal of variance in how it was incorporated in assessments. Bloom's concepts of effective questioning were employed during teacher training, which leads to the conclusion that in Bloom's framework should be incorporated in the pre-service training pedagogy as it could greatly improve the quality of instruction and the level of student engagement. This evidence further supports the need to utilize Bloom's Taxonomy in crafting assessments that foster the development of critical thinking Doğan et al (2023). Application in (Banda et al, 2023) investigated the use of Bloom's Taxonomy in the subdividing of the cognitive process development continuum among college level learners. The results showed how most educators attempted to use Bloom's taxonomy principles in describing the structure of the course and assessments and were quick to point lack of training as the chief reason. This research supports the need for training programs designed to teach educators Bloom's Taxonomy in order to extend its use to construct more effective learning activities and assessment activities, culminating in greater emphasis on evaluation of student learning outcomes (Banda et al, 2023).

3 LINGUISTIC ASPECTS OF BLOOM'S TAXONOMY AND BLENDED LEARNING

Pikhart and Klímová (2019) studied the use of linguistic components of Bloom's Taxonomy in blended learning. They discovered how as much as incorporating Bloom's terminology improved course design and improved student engagement, it was the systematic approach that really enhanced the course design. These results indicate that Bloom's pervasive taxonomy may provide closure and broaden the framework's impact on language, understanding and application, hence the value added by Bloom's Taxonomy to assessment design in current educational practices (Pikhart & Klímová, 2019). The impact on incorporating Cognitive Load Theory (CLT) on assessment tasks designed around Bloom's Taxonomy within microlearning modules was illustrated in (Lopez, 2024). The study emphasized that the cognitive level of the assessment tasks and the students' level of learning should be matched in order to achieve optimal retention and understanding. It was established in this research that through the application of CLT to Bloom's Taxonomy, there is an imbalance between cognitive load and cognitive objectives, hence the need to add reframed CLT and Bloom's Taxonomy as educational frameworks to the discourse on integrating cognitive theory with assessment design (Lopez, 2024).

Asma and Sarnou (2020) focused on the application of Cognitive Load Theory as an Instructional design framework and critiqued it to Bloom's Taxonomy to form an integrated assessment framework. It was emphasized that there is a need to understand the cognitive architecture of students in order to design assessments that do not bombard the learners, but rather, foster learning environments. The relationship between CLT and Bloom's Taxonomy further suggests grounding assessments in

theoretical frameworks can be productive, particularly in relation to Bloom's Taxonomy, which continues to remain useful and versatile in use. Such frameworks are especially garnered towards assessments, and hence, educators, and especially, Bloom's Taxonomy, need to be equipped with such frameworks. This professional neglect, in addition to the lack of evidence of student-centered approaches as professional development, demonstrates improvement prospects. Integrating Bloom's Taxonomy with other frameworks, particularly CLT, opens new avenues for further development and refinement of learning assessments to foster and promote learner-centred outcomes and experiences.

3.1 CEFR in Language Proficiency Alignment

The CEFR offers an effective and comprehensive framework to assess and relate language proficiency in different contexts. Having been developed in the 1990s, it has gained a lot of prominence and recognition, especially as the need for a unified and standardized language assessment grows.

3.2 Assumption of Language Proficiency

3.2.1 Alignment of Assessments.

In developing language assessments, specific proficiency levels must be identified and aligned to the respective level on the CEFR since it is a mapped framework of language proficiency levels (blinded citations, 2024). The illustrative case of the role of CEFR framework in the rest of Marzaini and Yusoff (2022) in Malaysia clearly demonstrates the role of the framework in improving understanding and the implementation of the assessment of language proficiency by teachers (Marzaini & Yusoff, 2022).

3.2.2. Enhancing Outcomes of Learners.

Language acquisition and learner motivation has advanced due to the positive implementation of fully aligned CEFR assessments. Learners' work and research clearly show that descriptors do serve to guide teachers in the production of appropriate assessments needed by the learner's scaffolding assessment because of the proficiency levels identified (blinded citations, 2024).

3.3 Issues and Implications

Though positive, the implementation of CEFR still faces harsh criticism concerning its intricacies and the obstacles of consistent use. The difference in opinions that teachers have within a group, and miss out on achieving the correct assessment and evaluation on the learner, underscores the need to change the language on the topic to zealous nurturance of the underpinning professional aims.

3.4 Task Difficulty and Cognitive Load Theory

Managing the intricacy of the tasks to be done, within Cognitive Load Theory, is a fundamental aspect of learning that must be taken into serious consideration. Assessments should ensure appropriate levels of mental effort to encourage effective learning experiences (Sweller, 1988; Huang et al., 2024) (Mohammed & Omar, 2020) (Herrmann-Werner et al., 2023).

3.4.1 Balancing Cognitive Load in Assessments

3.4.1.1 Task Design

Effective assessment design requires careful attention to the cognitive load placed on students. Retention and comprehension are improved when the underlying cognitive load of an assessment is understood. Mohammed and Omar (2020) analyse the relationship between Bloom's

Taxonomy and cognitive load in exam question design and emphasize the importance of applying a 'moderate' approach relative to the learner's working memory (Mohammed & Omar, 2020).

3.4.1.2 Adaptive Learning

Huang et al. (2024) examine adaptive assessment techniques where the level of the task is altered during performance according to an analysis of the learner's current actions in real time. Targeted learning is likely to occur because cognitive overload is minimized and a more individualized assessment is provided (Herrmann-Werner et al., 2023).

Future research should seek to clarify the relationships between cognitive load elements, Bloom's taxonomy, and the CEFR framework. It is also the case that the mechanisms to implement this cognitive load management are particularly limited and require urgent attention.

3.5 Existing Tools: Strengths and Weaknesses

Several frameworks and tools designed in instruments to help educators pivot around Bloom's Taxonomy, CEFR, and CLT are Bloom's Wheels, the L-TRU model, and assessment tools with AI capabilities.

Bloom's Wheels. Bloom's Wheels are graphic tools that depict the various capabilities within the cognitive domain to assist teachers in setting assignments and tests that target specific levels within the domain. While their design is functional and informative, and their use saves time and effort, their rigid format is not able to account for the state of constant change that characterises the educational environment.

The L-TRU Framework incorporates Bloom's Taxonomy in language responsive teaching whereby it includes dimensions of fairness and equity, as well as student participation. While it has been claimed that it fosters equity, it is apparent that its use is designed with the expectation that teachers have undergone considerable training (Prediger & Neugebauer, 2020; Neugebauer & Prediger, 2022).

While these tools provide automated and, in most cases, scalable approaches to the evaluation of assessment instruments, their lack of clarity in proprietary algorithms lowers educators' acceptance of AI-generated suggestions. Most AI in education equity and inclusivity need to be addressed (Herrmann-Werner et al., 2023).

3.6 The Need for an Integrated Tool: The Wheel for Integrated Scaffolded Evaluation through CEFR and Bloom Linked Reference (WISE-CB)

Even with the successes that are represented in these tools and frameworks, there is a need for practicality and fully integrated and cohesive set of instruments for Bloom's Taxonomy, CEFR, and Cognitive Load Theory. The aforementioned The Wheel for Integrated Scaffolded Evaluation through CEFR and Bloom Linked Reference (WISE-CB) aims to encompass a wide range of resources for educators to develop assessments that are balanced cognitively, linguistically, and pedagogically appropriate. As a flexible reference tool, WISE-CB would assist educators in designing assessments that adequately meet the different complexities of learners and promote equitable assessment practices.

The interweaving of Bloom's Taxonomy, CEFR, and Cognitive Load Theory are pivotal in advancing the appreciation of assessment practices in higher education and in most paradigms, always remains a work in progress. Many tools exist to aid practitioners and educators but the absence of a unifying mechanism synthesizes and reframes their potential to positively affect the educational opportunities and advancements of learners. The Wheel for Integrated Scaffolded Evaluation through

CEFR and Bloom Linked Reference (WISE-CB) aims to offer educators a framework to develop assessments that are aimed at measuring learning effectively and equitably at every level of the learning process.

4 METHODOLOGIES

4.1 Research Design

The method of this study is based on a qualitative content analysis using a full literature review. This approach involves collecting and analysing data from academic publications such as online databases, reports, and other credible media sources to explore the previous research relevant to the study. This enables a systematic and in-depth examination of the linguistic features that cannot be adequately captured through a quantitative approach (Wildemuth, 2016, as cited in Mohd Farhan Abd Rahman et al., 2025). Specifically, the analysis focuses on identifying and classifying Bloom's Taxonomy verbs according to CEFR levels and cognitive load. This method integrates educational taxonomies, lexical frames, and psycholinguistic theoretical constructs to support target vocabulary analysis that not only reflects cognitive complexity but also aligns with learners' language proficiency levels.

4.1.1 Phase 1: Identification of Bloom's Taxonomy Verbs

The initial framework (Bloom, 1956), its refinement (Anderson & Krathwohl, 2001), and later modifications in educational research (Krathwohl, 2002; Adams, 2015; Ramirez, 2016) were all included in the comprehensive evaluation of important and recent publications on Bloom's Taxonomy. Core action verbs that embody the six cognitive domains-Remember, Understand, Apply, Analyse, Evaluate, and Create-were extracted using this approach. To guarantee validity and consistency, each verb was recorded and cross-referenced across sources.

4.1.2 Phase 2: Integration with CEFR Vocabulary Levels

Combining CEFR Vocabulary Levels with Each of Bloom's verbs was compared to the Cambridge English Online Dictionary and CEFR wordlists in order to match them with the language proficiency of the learners. Verbs were grouped based on their lexical complexity in accordance with CEFR guidelines:

1. Degree (A1-B2);
2. Postgraduate (A1-C2);
3. Diploma (A1-B1).

This made sure that, according to the learners' stage of study, the suggested verbs were both linguistically accessible and mirrored cognitive levels. High-frequency verbs like list (A1), for instance, were mapped to the "Remember" domain, whereas more complicated verbs like synthesise (C1-C2) were allocated to the "Create" domain.

4.1.3 Phase 3: Cognitive Load Consideration

Verb matching with CEFR levels was assessed using the Cognitive Load Theory (Sweller, 1988; Paas & Ayres, 2014). To make sure that exercises do not exceed working memory capacity, verbs that need higher-order thinking (such as evaluate, hypothesise, and design) were evaluated against learners' expected proficiency. By guaranteeing a smooth transition from lower-order verbs that are suitable for beginning learners to higher-order verbs that are suitable for advanced learners, this step addresses intrinsic and extraneous load.

4.1.4 Phase 4: Classification and Verification

The identified verbs were categorised based on CEFR levels and Bloom's hierarchical domains. Subject-matter experts in instructional design and English Language Teaching (ELT) were consulted in order to conduct expert validation. The professionals evaluated the mapping's suitability, guaranteeing linguistic and educational accuracy.

4.1.5 Phase 5: Development of the Reference Kit

The last step was to combine the verified verbs into a Bloom's Taxonomy–CEFR Reference Kit, which was displayed graphically as a wheel. This tool is intended to:

1. Help instructors choose verbs that are both linguistically and pedagogically appropriate.
2. Provide helpful advice on how to create exam questions that strike a balance between learner proficiency and cognitive demand.
3. Act as a scaffold to lessen unnecessary mental strain while maintaining the emphasis on content engagement.

5 OUTCOMES

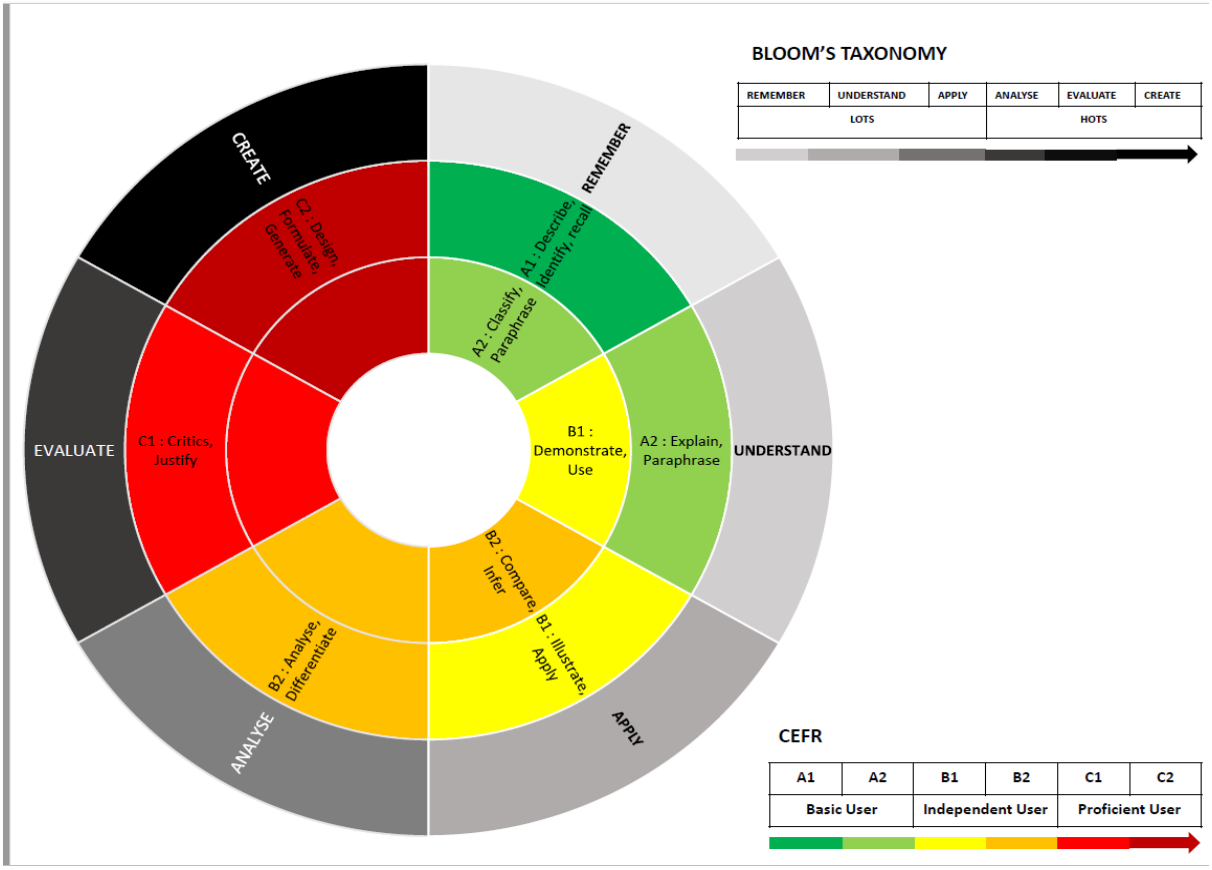

Figure 1 The Wheel for Integrated Scaffolded Evaluation through CEFR and Bloom Linked Reference (WISE-CB)
Source: Developed by the researcher (2025)

The results of this study provide evidence that Bloom's Taxonomy, CEFR, and Cognitive Load Theory all integrated into one and linked with a tool, creates a validated framework to enhance assessment literacy in higher education. The Wheel for Integrated Scaffolded Evaluation through CEFR

and Bloom Linked Reference (WISE-CB) empowers lecturers in Bloom's taxonomy to methodically choose action verbs and design exam questions that are linguistically easy and cognitively challenging. The wheel aligns CEFR proficiency levels with Bloom's taxonomy so that in all stages–diploma, undergraduate, and postgraduate–learners are assessed through tasks that represent their actual language and cognitive readiness. This alignment mitigates exam expectation and student performance mismatches, thus contributing to the attainment of a fairer and equitable assessment.

WISE_CB's practical significance is that it extends the innovative assessment design discourse in higher education. The tool implemented innovative frameworks approach to assessment design beyond single institutions and disciplines. The wheel, through expert validation and theoretical grounding, accentuates the need to incorporate linguistic and cognitive scaffolding to enhance learning. Thus, the study outlines the steps lecturers can follow to provide innovative quality assessments that encourage the students to engage in deeper learning while enabling the institutions to achieve their goals of inclusive and transparent evaluations.

6 CONCLUSIONS

The present research attests to the need for inclusion of the cognitive, linguistic, and instructional aspects when designing assessments for higher education. Bloom's Taxonomy has continued to serve as a foundation for assessing higher order thinking, although there has been a considerable gap in its use due to a disconnect between the language used in assessments and students' language proficiency, as well as a lack of adequate cognitive load evaluation. The Wheel for Integrated Scaffolded Evaluation through CEFR and Bloom Linked Reference (WISE-CB) simultaneously fills these gaps, offering gap-bridging assessment frameworks for CEFR level aligned argumentation in an instructional and research context. By doing so, the present research articulates that WISE-CB enhances assessment literacy and fosters greater equity and inclusivity in assessment and framework use. Its ease of adaptation in and across programs and institutions positions it as an important framework to assess thinking at the higher instructional levels, while also reflecting the learners' level of understanding. This research asserts that steady advancement in teaching and learning frameworks for the 21st century is attained by demonstrating that Bloom's cognitive levels, CEFR proficiency levels, and cognitive load theory remain interrelated, thus achieving an integrated framework for streamlined application.

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Amer Fawwaz bin Mohamad Yasid developed the Wheel for Integrated Scaffolded Evaluation through CEFR and Bloom Linked Reference (WISE-CB). Nurul Kamalia Yusuf developed the Structure of the articles including Literature Review, Methodology Section and Proofing of the articles. Raja Mayang Delima Mohamad Beta contributed on the idea toward the development of WISE-CB model.

CONFLICT OF INTEREST

There was no conflict of interest.

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