

# A Framework for Discipline-Specific Learning, Teaching, and Assessment of Psychomotor Skills in Higher Education

Eric Matshete Chweu

<sup>a</sup> Curriculum Development and Support, Tshwane University of Technology, Private Bag X680 Staatartillerie Road Pretoria West 0001, Pretoria, South Africa

\*Corresponding author: [chweuem@tut.ac.za](mailto:chweuem@tut.ac.za)

**Abstract**— This study investigated the extent to which psychomotor skills are assessed in higher education and proposed a framework to enhance the assessment of these skills. While higher education institutions globally assess students' knowledge thoroughly, the assessment of psychomotor skills is often implicit, unsystematic, and inadequate. This research aims to address this gap by using Bloom's taxonomy to develop a comprehensive assessment framework. The research question was: "How can Bloom's taxonomy's psychomotor domain be used to create a framework for assessing psychomotor skills?" A quantitative method was employed, utilizing the Trilogy Assessment Psychomotor Domain Inventory to gather data from 268 South African University of Technology lecturers. Analysis with SPSS version 28.0 and reliability testing showed high internal consistency. Findings revealed that 54% of lecturers did not assess psychomotor skills, highlighting the necessity for a structured assessment framework to improve learning and teaching outcomes.

**Keywords**— Psychomotor Domain; Assessment; Bloom's trilogy; Discipline-specific; psychomotor skills

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## I. INTRODUCTION

Research on evaluating psychomotor skills often addresses general issues while overlooking the unique contexts that shape their practical application (Coffey et al. 2011). Stakeholders continue to debate the best methods for teaching and assessing these skills to prepare professionals for the modern workplace (Frisque, Lin, and Kolb 2004). Ridgway, McCusker, and Pead (2004) highlight a significant gap in assessments and analyses of workplace-relevant psychomotor skills. While Juanda (2022) notes broad agreement on the importance of these skills, the best approach remains unclear. Despite their critical importance, assessments targeting workplace-relevant psychomotor skills are scarce (Coffey et al. 2011). This study aims to bridge this gap through detailed participant data and literature analysis.

Existing literature provides a foundation for measuring psychomotor skills (Bitok 2020). Universities must define and integrate these skills into student learning outcomes (Ananiadou and Claro 2009). However, Ananiadou and Claro (2009) argue that psychomotor skills assessment in higher education is often poor, implicit, and unsystematic. This issue frames the research problem, as findings indicate that university lecturers struggle to assess psychomotor skills systematically and clearly. This insight underscores the need to highlight the importance of these skills in learning, teaching, and assessment (LTAs) processes. Lasakova, Bajzikova, and Dedze (2017), advocate for revising higher education curricula to develop psychomotor skills that align with industry requirements and foster innovation. Büth et al. (2017) suggest

supplementary training to bridge the gap between academic education and industry needs, while Baird et al. (2017) emphasize the role of learning theories in shaping assessment processes. In today's dynamic work environment, employers seek graduates with the requisite knowledge, skills, and values (Quinn and Rohrbaugh 1983).

This study aimed to determine the extent of psychomotor skills assessment and propose a framework for stakeholders to develop and apply these skills in LTAs. Using the self-developed Trilogy Assessment Psychomotor Domain Inventory (TAPDI), the study addresses the lack of a specific framework in this field. The proposed framework is designed to assist learners, lecturers, parents/guardians, employers, public sectors, professional societies, associations, councils, curriculum developers, community representatives, and organizations such as local chambers of commerce. This framework aims to guide stakeholders in planning, organizing, implementing, and achieving effective LTAs of discipline-specific psychomotor skills in higher education.

## II. LITERATURE STUDY

### A. Assessment of psychomotor skills

To guarantee the effectiveness of the numerous assessment types, instruments, and methods involved in implementing the skills domain, each assessment type, instrument, and method must be thoroughly and articulated (Baharom et al. 2016). This detailed explanation ensures that the methods used for assessing skills are comprehensively understood and appropriately applied. Additionally, assessing these skills requires a careful evaluation of the physical

procedures involved in their execution (Simpson, 1966; Dave, 1970; Harrow 1972).

According to Simpson (1966), Dave (1970), and Harrow (1972), the development and assessment of psychomotor skills are structured around seven categories. These categories are arranged in a hierarchy, starting from the most basic movements and coordination and advancing to more complex applications of motor skills. This structured approach allows for a systematic evaluation of skill progression, from fundamental to intricate levels of motor skill proficiency. By adhering to these categories, educators can ensure a comprehensive assessment process that effectively captures the nuances of skill development and application.

#### B. *Discipline-specific psychomotor skills.*

Psychomotor skills are typically categorized into seven major levels, ranging from basic to advanced, and include aspects such as movement, coordination, and motor skills. The progression of these skills is assessed through various metrics, including speed, precision, distance, and complexity (Simpson 1966; Dave 1970; Harrow 1972). Consequently, the researchers argue that lecturers should make a deliberate effort to tailor these psychomotor

To effectively incorporate psychomotor skills into any discipline's curriculum, Atkinson (2018) recommends that lecturers address crucial questions when formulating module outcomes: "What tools are utilized within your discipline? Should students not demonstrate progressive proficiency with these tools as they advance through their studies?" The researchers align with Atkinson's perspective, underscoring the critical focus of this study and the importance of integrating the psychomotor domain into curriculum design. This emphasis on discipline-specific tools highlights why psychomotor skills should be a fundamental consideration for lecturers when developing their module outcomes. Students engaged in the psychomotor domain need to be well-versed with the tools pertinent to their specific discipline (Baharom et al. 2016).

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education, with the seven major categories being organization, adaptation, complex response, mechanism, guided response, and set. This comprehensive approach ensures that psychomotor skills are effectively developed and assessed within the context of each specific discipline.

#### C. *Industry psychomotor skills requirements*

Business and industry are concerned with skills that may be applied immediately to specific job requirements, as well as how graduating students can contribute directly to their economic operations (Brady and Kennedy 2009). For this, Assessments are required to identify students who display good skills, and as a result, students' potential for continued study should be identified, along with recommendations for the best facilities (Brady and Kennedy 2009).

The author further indicated that these skills include, Skills in operating industry-specific machinery, tools, and software, precision in handling and manipulating tools, components, or materials, ability to troubleshoot and resolve issues swiftly during operations, skillful coordination to perform tasks quickly and accurately, often involving multitasking., Ability to adjust methods and techniques based on changing conditions and skills in inspecting and ensuring the quality of work meets industry standards. In this regard, universities should try "to properly identify and conceptualize the set of skills" required by industry, to incorporate into the learning outcomes that every student should be able to reach by the end of their studies (Ananiadou and Claro 2009).

This study suggests that skills recognized by industry should be integrated into the acquisition, learning, LTAs process within higher education to ensure effective assessment. The proposed framework is designed to help stakeholders embed industry skills into LTAs practices.

### III. THEORETICAL FRAMEWORK

Bloom's taxonomy of educational objectives was adopted for this study to determine how psychomotor skills assessment might provide solutions to the problem. Krathwohl and Anderson (2010), stated that Bloom's taxonomy is the panorama of the range of educational possibilities against which the constrained breadth and depth of any educational program or curriculum could be measured and provides support for the lecturers' opinions. According to Bitok (2020), the psychomotor skills domain is not merely a component but a foundational element that permeates every aspect of education. By focusing on this domain, the study underscores the importance of practical skills and hands-on learning experiences, which are integral to developing comprehensive educational programs. The framework was published as Bloom's Taxonomy of Educational Objectives and consisted of three domains: The cognitive domain (knowledge domain), the psychomotor domain (skills domain), and the affective domain (psychomotor skills domain) (IACBE 2014-2016). However, this study was specifically centered on the

psychomotor skills domain, recognizing its crucial role in the entire learning, teaching, and assessment process.

#### A. Psychomotor skills domain

Psychomotor skills refer to physical movement and coordination skills, and they play a crucial role in a variety of daily activities that need precise motor skills, ranging from simple tasks to complex movements (Olya and Levitas 2023). Psychomotor skills are those skills that need physical dexterity, flexibility, or strength, as well as motor control and these skills have been evolving since parents taught their children to hunt, stitch skins together, and make fire. (Atkinson 2018). Hill, Fadel, and Bialik (2018), argue that “the most common classification of psychomotor skills is “gross” and “fine” where gross motor skills are defined as those that involve larger groups of muscles (for example, arms or legs), while fine motor skills are those that involve smaller groups of muscles such as those found in fingers. These skills are often known as manual or physical body skills and are typically developed in a discipline-specific environment (Baharom et al. 2016) and learners can enhance their practical and hands-on skills in these environments. It is crucial to be able to assess these skills (Hill et al. 2018). The study’s dedicated focus on the psychomotor domain aims to bridge the gap between theoretical knowledge and practical application, ensuring that learners are not only knowledgeable but also adept in the skills necessary for their fields. The categories of the skills domain include:

1) *Perception*: “Perception is the ability to use sensory cues to guide motor activity” (Sideeg, 2016; Baharom et al. 2016). “This ranges from sensory stimulation, through cue selection, to translation.” At this level, the learning outcomes are on “the ability to use sensory cues to guide motor activity” through cue selection to translation (Sideeg 2016; Baharom et al. 2016).

2) *Set*: Readiness to act includes mental, physical, and emotional sets (Sideeg 2016; Baharom et al. 2016). “These three sets are dispositions that predetermine a person’s response to different situations (sometimes called mindsets)” (Sideeg 2016; Baharom et al. 2016). At this level, the learning outcomes include the readiness to act by responding to different situations.

3) *Guided Response*: In the guided response, the early stages of learning, complex skill includes imitation and trial and error (Sideeg 2016; Baharom et al. 2016). Performance is achieved by practicing. At this level, the learning outcomes include imitation and trial and error achieved by practicing.

4) *Mechanism*: This mechanism is the intermediate stage in learning a complex skill. “The learned responses have become habitual, and the movements can be performed with some confidence and proficiency” (Sideeg 2016; Baharom et al. 2016). At this level, the learning outcomes lead to confidence and proficiency performance through the acquisition of complex skills.

5) *Complex Response*: In the complex response, the skillful performance of motor acts involves complex

movement patterns. “Proficiency is indicated by a quick, accurate, and highly coordinated performance, requiring a minimum of energy” (Sideeg 2016; Baharom et al. 2016). At this level, the learning outcomes involve performing a skill without hesitation, and automation.

6) *Adaptation*: At the adaptation level, “skills are well developed, and the individual can modify movement patterns to fit special requirements” (Sideeg 2016; Baharom et al. 2016). Here the learning outcomes emphasise the adaptation of skills to fit special requirements.

7) *Organization*: The organization level allows the “creating of new movement patterns to fit a particular situation or specific problem” (Sideeg 2016; Baharom et al. 2016). At this level, the learning outcomes emphasize creativity based on highly developed skills.

#### IV. RESEARCH QUESTION

How can Bloom’s taxonomy’s psychomotor domain be used to build a framework for assessing the psychomotor skills at the study university?

#### V. METHODOLOGY

A quantitative (QUAN) method was used to create a framework for assessing psychomotor skills in certain disciplines. The QUAN data is a numerical form from survey questions associated with natural science or a positivist perspective (Moon and Moon 2004). The QUAN technique investigated the associations between variables by collecting and evaluating numeric data reported in numbers or scores with standardized measurement tools (Plano Clark and Ivankova 2016). The quantitative data was examined using SPSS version 28.0, which interpreted the data using descriptive analysis and a strong Cronbach’s alpha value for internal consistency.

#### A. Participants

The participants in this study university were 268 lecturers. Table 1 demonstrates the biographical data of lecturers according to gender, age, qualification, experience, and employment levels.

TABLE I  
BIOGRAPHICAL DATA OF LECTURERS ACCORDING TO EMPLOYMENT LEVEL

Employment level	Female	Male	Total
Junior lecturer	3 (1.1)	3 (1.1)	6 (2.2)
Lecturer	105 (39.2)	92 (34.3)	197 (73.5)
Senior lecturer	24 (9.0)	31 (11.6)	55 (20.5)
Associate Professor	2 (0.7)	3 (1.1)	5 (1.9)
Professor	2 (0.7)	3 (1.1)	5 (1.9)
Total	136 (50.7)	132 (49.3)	268 (100)

The results revealed that almost three-quarters of the lecturers, namely 73.5%, were employed as

lecturers. Of these lecturers, 39.2% were female. This was followed by less than a quarter, namely 20.5%, of the lecturers being employed as senior lecturers. Of these lecturers, 11.6% were males.

### B. Instrument and Procedure

The self-developed TAPDI was used to gather quantitative data on the extent to which psychomotor skills were assessed. The TAPDI was adapted from Bloom's Taxonomy of Educational Objectives (Bloom 1956). In this case, the TAPDI consisted of seven subscales with 23 items relating to the psychomotor domain's organization [three items], adaptation [two items], complex response [five items], mechanism [four items], guided response [three items], set [three items], and perception [three items]. The scales used were indicated as follows: 1 = Extremely Explicit; 2 = Very Explicit, 3 = Explicit; 4 = Somewhat Explicit, and 5 = Not at all Explicit.

### C. Instrument Validity

Validity refers to the strength of our conclusions, inferences, or propositions, providing "the best available approximation to the truth or falsity of a given inference, proposition, or conclusion" (Creswell and Miller 2000). The validity of the TAPDI was also determined utilizing content validity. To achieve this, exploratory factor analysis was determined. It was discovered that the Kaiser-Meyer-Olkin and Bartlett's test, was .884 and that this value was statistically significant ( $p < 0.05$ ). According to the literature, KMO between 0.7 and 1 indicates that the sampling is adequate, so the researchers can proceed and compute the exploratory factor analysis (Kaiser 1974).

In determining the factor structure from the data, a Varimax rotation was used to determine the factor structure from the data. TAPDI is said to be made up of seven components (Bloom 1956). These factors have to do with (a) Perception [PSYDP], (b) Set [PSYDS], (c) Guided response [PSYDGR], (d) Mechanism [PSYDM], (e) Complex response [PSYDCR], and (f) Adaptation [PSYDA] (g) Organisation [PSYDO].

We began by analyzing with a five-factor solution and a factor loading value of 0.35 cut-off using a varimax rotation in this inventory. The results revealed that the rotated matrix generated a five-factor solution that explained 80.1% of the total variance. Here, factors relating to PSYDCR7 (Proficiency of accurate, coordinated performance), PSYDCR8 (Proficiency of highly coordinated performance), PSYDCR9 (Performance without hesitation), PSYDGR15 (Multifaceted skill that includes imitation in the early stages of learning), PSYDGR16 (Multifaceted skill that includes trial and error in the early stages of learning), PSYDGR17 (Practical performances, are assessed over a quarter with the highest being), PSYDM14 (Movements that can be performed with some proficiency), PSYDP23 (The ability to use bodily signals to guide stimulation,

through translation) and PSYDCR10 (Performance that encourages automation) cross-loaded.

We then ran a five-factor solution with a 0.5 cut-off point. It provided a similar eigenvalue of 80.1% with two factors PSYDP23 (The ability to use bodily signals to guide stimulation, through translation) and PSYDCR10 (Performance that encourages automation) cross-loading. We then ran the seven-factor solution at a 0.5 cut-off point. The results showed the seven factors at an improved eigenvalue of 86.3%. Here three factors PSYDGR16 (Multifaceted skill that includes trial and error in the early stages of learning), PSYDGR17 (Practical performances, are assessed over a quarter with the highest being), and PSYDS20 (Emotional readiness to act as a disposition that predetermines a person's response to different situations) cross-loaded. We decided to run it again with a seven-factor solution and a cut-off point of 0.6. The seven factors yielded a total variance eigenvalue of 86.3%. In this situation, no factors were omitted or cross-loaded. Similarly, a seven-factor solution was discovered using the scree plot (see Figure 1).

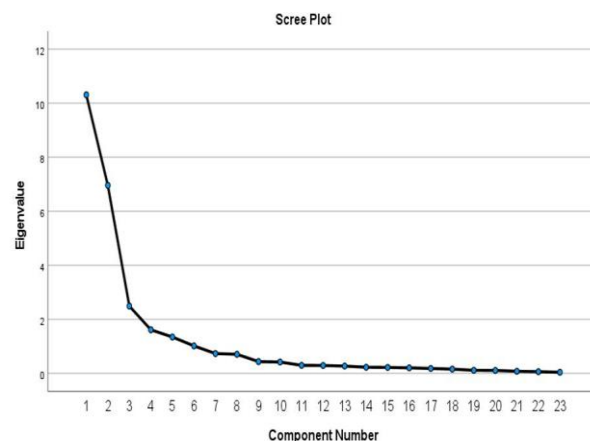


Figure 1: Scree plot depicting the number of rotated factors TAPDI.

Reliability is the degree of consistency with which instances are assigned to the same category by different observers or the same observer on different occasions (McMillan and Schumacher 2010). This implies, that the instrument consistently measures the same thing. In this study, the reliability of the TAPDI was determined by computing Cronbach's alpha (Cronbach 1951). The alpha value for the TAPDI in Table 2 was found to be Psychomotor Domain Organisation PSYDO = .92, Psychomotor Domain Adaptation (PSYDA) = .93, Psychomotor Domain Complex Response (PSYDCR) = .95, Psychomotor Domain Mechanism (PSYDM) .91, Psychomotor Domain Guided response (PSYDGR) = .82, Psychomotor Domain Set (PSYDS) and Psychomotor Domain Perception (PSYDP) at .76 which suggests that the scores from this inventory were internally consistent (reliable). This was deemed reliable because researchers, such as Tavakol and Dennick (2011) point out that a score of alphas above 0.90 is the best score.

## VI. RESULTS

This study aimed to evaluate how extensively psychomotor skills were assessed and to propose a framework for stakeholders to develop and implement relevant LTAs outcomes for these skills. Descriptive statistics, including frequency distribution and percentage, were used to analyze the data. By applying TAPDI, the study ensures that stakeholders are fully informed about all necessary factors for a comprehensive assessment of psychomotor skills. These sub-constructs comprised (PSYDO) [three items], the psychomotor domain's adaptation (PSYDA) [two items], the psychomotor domain's complex response (PSYDCR) [five items], the psychomotor domain's mechanism (PSYDM) [four items], psychomotor domain's guided response (PSYDGR) [three items], psychomotor domain's set (PSYDS) [three items], psychomotor domain's perception (PSYDP) [three items]. Table 2 presents the results for the seven sub-constructs of the psychomotor skills domain, encompassing 23 items.

The first sub-construct, PSYDO comprises three items. The results also showed that the majority of lecturers (93.2%) assessed PSYDO2 [Creation of new movement patterns to fit a specific problem] explicitly. Table 2 revealed that the majority of lectures (92.9%) assessed PSYDO1 [Creation of new movement patterns to fit a particular situation] explicitly. The results also revealed that the majority (91.8%) of the lecturers assessed PSYDO3 [Creativity based upon advanced skills] explicitly. This implies that the majority of the lecturers assessed skills at a higher-order level, where the learners were required to show the skills of creating movement patterns that fit a particular situation or specific problem.

The second sub-construct, PSYDA consists of two items. The results indicated that the majority of the lecturers (95.9%) assessed PSYDA5 [Modification of movement patterns to fit special requirements] explicitly. It was also found that the majority of the lecturers (95.1%) assessed PSYDA4 [Discipline-related skills as informed by stakeholders] explicitly. This suggests that the majority of lecturers assessed skills at a higher-order level where the learners were required to modify movement patterns to fit the special requirements.

The third sub-construct, PSYDCR comprised five items. The results showed that the majority of the lecturers assessed all the items explicitly. The highest of the items assessed explicitly by the majority of the lecturers (95.5%) was PSYDCR6 [Proficiency of quick coordinated performance]. This was followed by 93.7% of the lecturers who had assessed PSYDCR9 [Performance without hesitation]. This implies that the majority of the lecturers assessed the skills at a high-order level explicitly where the learners were required to carry out complex, highly coordinated performances quickly and accurately.

The fourth sub-construct, PSYDM, consists of four items. The results indicated that about one in three lecturers (69.1%), somewhat to not at all, assessed PSYDM11 [This is the intermediate stage in learning a complex (multifaceted)

skill]. It was also found that about one in three lecturers (68.6%) somewhat to not at all, assessed PSYDM13 [Movements that can be performed with some confidence]. This implies that one in three lecturers did not at all assess skills at a middle-order level where learners were required to perform complex skills with some confidence and proficiency.

TABLE 2  
TRILOGY ASSESSMENT PSYCHOMOTOR DOMAIN INVENTORY

No.	Codes	<i>Extremely Explicit</i>	<i>Very Explicit</i>	<i>Explicit</i>	<i>Somewhat Explicit</i>	<i>Not at all Explicit</i>
<i>PSYCHOMOTOR DOMAIN'S ORGANISATION (PSYDO)</i>						
1.	PSYDO1	54 (20.1)	98 (36.6)	97 (36.2)	13 (4.9)	6 (2.2)
2.	PSYDO2	51 (19.0)	107 (39.9)	92 (34.3)	11 (4.1)	7 (2.6)
3.	PSYDO3	59 (22.0)	96 (35.8)	91 (34.0)	10 (3.7)	12 (4.5)
<i>PSYCHOMOTOR DOMAIN'S ADAPTATION (PSYDA)</i>						
4.	PSYDA4	64 (23.9)	107 (39.9)	84 (31.3)	7 (2.6)	6 (2.2)
5.	PSYDA5	65 (24.3)	103 (38.4)	89 (33.2)	8 (3.0)	3 (1.1)
<i>PSYCHOMOTOR DOMAIN'S COMPLEX RESPONSE (PSYDCR)</i>						
6.	PSYDCR6	70 (26.1)	97 (36.2)	89 (33.2)	8 (3.0)	4 (1.5)
7.	PSYDCR7	99 (36.9)	70 (26.1)	77 (28.7)	11 (4.1)	11 (4.1)
<i>PSYCHOMOTOR DOMAIN'S ORGANISATION (PSYDO)</i>						
8.	PSYDCR8	106 (39.6)	73 (27.2)	68 (25.4)	11 (4.1)	10 (3.7)
9.	PSYDCR9	114 (42.5)	65 (24.3)	72 (26.9)	7 (2.6)	10 (3.7)
10.	PSYDCR10	112 (41.8)	64 (23.9)	72 (26.9)	7 (2.6)	13 (4.9)
<i>PSYCHOMOTOR DOMAIN'S MECHANISM (PSYDM)</i>						
11.	PSYDM11	14 (5.2)	22 (8.2)	47 (17.5)	72 (26.9)	113 (42.2)
12.	PSYDM12	12 (4.5)	28 (10.4)	49 (18.3)	68 (25.4)	111 (41.4)
13.	PSYDM13	12 (4.5)	26 (9.7)	46 (17.2)	73 (27.2)	111 (41.4)
14.	PSYDM14	12 (4.5)	23 (8.6)	100 (37.3)	4 (17.9)	85 (31.7)
<i>PSYCHOMOTOR DOMAIN'S GUIDED RESPONSE (PSYDGR)</i>						
15.	PSYDGR15	11 (4.1)	2 (8.2)	90 (33.6)	47 (17.5)	98 (36.6)
16.	PSYDGR16	10 (3.7)	21 (7.8)	44 (16.4)	64 (23.9)	129 (48.1)
17.	PSYDGR17	11 (4.1)	30 (11.2)	46 (17.2)	59 (22.0)	122 (45.5)
<i>PSYCHOMOTOR DOMAIN'S SET (PSYDS)</i>						
18.	PSYDS18	13 (4.2)	28 (10.4)	95 (35.4)	38 (14.2)	94 (35.1)
19.	PSYDS19	11 (4.1)	29 (10.8)	92 (34.3)	40 (14.9)	96 (35.8)
20.	PSYDS20	16 (6.0)	47 (17.5)	70 (26.1)	54 (20.1)	81 (30.2)
<i>PSYCHOMOTOR DOMAIN'S SET (PSYDS)</i>						
21.	PSYDS18	13 (4.2)	28 (10.4)	95 (35.4)	38 (14.2)	94 (35.1)
22.	PSYDS19	11 (4.1)	29 (10.8)	92 (34.3)	40 (14.9)	96 (35.8)
23.	PSYDS20	16(6.0)	47(17.5)	70(26.1)	54(20.1)	81(30.2)

The fifth sub-construct, PSYDGR contains three items. The results show that more than three-quarters of the lecturers (72%), somewhat to not at all assessed PSYDGR16 [Multifaceted skill that includes trial and error in the early stages of learning]. The results revealed that one in three lecturers (67.5%), somewhat to not at all assessed PSYDGR17 [Practical performances]. This suggests that one in three of the lecturers was not at all assessing skills at a middle-order level where learners were required to exhibit skills learned through trial and error, practicals, or imitation.

The sixth sub-construct, PSYDS consists of three items. The results showed that more than half of the lecturers (50.7%), somewhat to not at all, assessed PSYDS19

[Physical readiness to function as a disposition that predetermines a person's response to different situations]. The results also revealed that more than half of the lecturers (50.3%) were somewhat to not at all, assessed PSYDS20 [Emotional readiness to act as a disposition that predetermines a person's response to different situations]. This implies that more than half of the lecturers did not at all, assess skills at a lower-order level where learners were required to respond to different situations.

The seventh sub-construct, PSYDP contains three items. The results showed that most of the lecturers (82.9%), assessed PSYDP22 [The ability to use bodily signals to guide stimulation, through signal selection] explicitly. The results revealed that more than half of the lecturers (59.7%),

assessed PSYDP21 [The ability to use bodily signals to guide motor activity] explicitly. This implies that below three-quarters of the lecturers (71.0%) assessed skills at a lower-order level explicitly where the learners were required to use sensory cues to guide motor activity through cue selection to translation.

## VII. THE PROPOSED FRAMEWORK

A framework for discipline-specific LTAs of psychomotor skills is based on Bloom's taxonomy (Sideeg 2016). To effectively assess psychomotor skills, it is crucial to align LTAs practices using the proposed framework. This framework ensures that learning outcomes and assessment tasks are systematically and explicitly designed for each level of skill development.

This framework aimed to support the stakeholders in developing assessment tasks that systematically, explicitly, and adequately assess psychomotor skills. When assessing psychomotor skills, stakeholders need to ensure that there is no artificial divide between LTAs practice. This framework suggests that stakeholders should only retain verbs that are pertinent to their discipline-specific psychomotor skills at each level and eliminate those that are not. Furthermore, the framework is not restricted to the verbs used in this study; instead, other discipline-specific verbs may be included as judged suitable by experts in the field. This framework tries to answer the question "What should the learner be able to do" and ensures that psychomotor skills are assessed comprehensively and accurately, integrating LTAs seamlessly.

At the first level, "perception," learners need to be informed about relevant work-related tasks and the reasons for performing them. Lecturers should teach learners how to execute tasks tailored to the work environment. Stakeholders should develop learning outcomes requiring learners to observe, notice, listen, describe, identify, and differentiate. Assessment instruments should then determine whether learners can effectively observe, view, attend to, and distinguish these tasks. For the second level, "set," learners must acquire the necessary procedures to prepare for authentic work-related tasks. Lecturers should teach these preparatory procedures, and stakeholders should create learning outcomes that require learners to position, state, identify, choose, prepare, and arrange. Assessment tools should verify whether learners can effectively position, state, and prepare for the tasks.

Concerning the third level, "guided response," learners should perform complex skills through trial and error, imitation, or practice. Lecturers must provide opportunities for this practice. Stakeholders should develop learning outcomes requiring learners to construct, operate, train, assemble, and measure. Assessment instruments should determine if learners can effectively tailor, coordinate, construct, and manipulate these skills. Regarding the fourth level, "mechanism," learners should perform tasks with confidence and proficiency. Lecturers should facilitate opportunities for learners to build these capabilities. Learning outcomes should require learners to sew, write, paint, and focus. Assessment tools should

ensure learners can perform these tasks with confidence and proficiency.

At the fifth level, "complex response," learners must execute complex tasks without hesitation, demonstrating quickness, accuracy, and coordination. Lecturers should create opportunities for learners to develop these skills. Learning outcomes should require learners to tailor, construct, operate, and assemble. Assessment instruments should verify that learners can perform these tasks accurately and swiftly. For the sixth level, "adaptation," learners should modify tasks to meet special requirements. Lecturers should teach them how to make these adjustments. Learning outcomes should require learners to adapt, alter, change, and reorganize. Assessment tools should ensure learners can modify tasks as needed. Concerning the seventh level, "organization," learners must perform tasks suited to specific situations or problems. Lecturers should guide them in tailoring tasks to particular contexts. Learning outcomes should require learners to arrange, compose, create, and design. Assessment instruments should verify that learners can effectively perform these tailored tasks.

## VIII. DISCUSSION AND/OR CONCLUSION

This study sought to answer the following question: How can Bloom's taxonomy's psychomotor domain be used to build/ develop a framework for assessing the psychomotor skills at the study university? The theory suggests that the psychomotor domain relates to physical dexterity, flexibility, or strength, as well as motor control (Atkinson, 2018). These skills have been continually evolving since parents first taught their children essential survival techniques such as hunting, stitching skins, and creating fire. This long-standing tradition of skill development reflects the deep-rooted and dynamic nature of human learning and adaptation, as noted by Atkinson (2018). Hill et al. (2018) classify psychomotor skills into "gross" (large muscle groups) and "fine" (small muscle groups). Developed in specialized environments, these manual skills are essential for hands-on learning and need thorough assessment (Baharom et al., 2016; Hill et al., 2018).

Atkinson (2018) further emphasizes that psychomotor learning, teaching, and assessment are crucial in education, with the seven major categories being organization, adaptation, complex response, mechanism, guided response, and set. If the goal of teaching were to develop psychomotor skills rather than simply convey information, the instruction would be designed to advance through the various levels of the psychomotor skills domain (Micklich 2012). When lecturers assess learners, they must use the action verbs associated with the psychomotor skills domain to guide them (Chweu, Mnisi, and Mji 2024).

The utilization of the framework may assist stakeholders improve LTAs of psychomotor and learning outcomes design in higher education. A framework for assessing psychomotor skills was developed to ensure that stakeholders systematically, explicitly, and adequately assess psychomotor skills. In this regard, the researchers assert that the involvement of stakeholders in developing assessment instruments relevant to assessing psychomotor

skills could have the potential to increase learners' likelihood of acquiring the industry psychomotor skills requirements. The suggested framework invites stakeholders, including industry, to collaborate on the development of psychomotor skill assessment instruments, which could benefit learners, the labor force, the community, and the economy.

Stakeholders are urged to adopt the psychomotor skills framework outlined in this study to address the issues of inconsistent, implicit, and inadequate psychomotor skills assessment. This framework will help stakeholders identify and design assessment tasks that align with the psychomotor skills required by the industry. By utilizing this framework, stakeholders will be equipped to create meaningful psychomotor skills outcomes, allowing graduates to effectively recognize, develop, and showcase their skills. Emphasizing the importance of psychomotor skills underscores their role in achieving a comprehensive educational experience. This approach aligns with modern educational objectives that focus on experiential learning and competency development crucial for success beyond the classroom.

#### Informed Consent

The study received formal ethics approval from the Study University, adhering to the established institutional ethics protocol. This approval was crucial to ensure that the research adhered to ethical standards and practices. Additionally, all participants provided their informed consent by signing the necessary consent forms. This process ensured that participants were fully aware of the study's objectives, procedures, and any potential risks involved, thereby safeguarding their rights and welfare throughout the research. The adherence to these ethical guidelines underscores the study's commitment to conducting research with integrity and respect for participant autonomy.

#### Conflict of Interest

The author of this study states that there are no conflicts of interest to disclose. This declaration confirms that the research is conducted independently, without personal, financial, or professional influences that might affect its integrity or objectivity. By explicitly stating the absence of conflicts, the author ensures that the findings and conclusions are derived solely from the research data and methodology, free from external pressures or biases. This commitment to transparency enhances the credibility and reliability of the study.

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