EXPLORING BLOOMS TAXONOMY FOR ASSESSING SKILLS AND VALUES AT A UNIVERSITY OF TECHNOLOGY

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Abstract

The aim of the study is to investigate the extent at which the skills and values are explicitly, systematically and adequately assessed in the lecturers’ assessment instruments. Bloom’s taxonomy is one of the most significant tools used in course design as it provides a rigorous framework for designing assessment tasks. Bloom’s Taxonomy is the theoretical framework that grounded this study. This paper presents the doctoral work in progress and the conceptual paper. Studies on assessment of skills and values revealed that the affective domain is the least applied and least understood of all Bloom’s Taxonomy trilogy. The researcher has not come across any literature or study and standardised instruments internationally and nationally that has investigated the explicitness, systematic and adequacy of assessing skills and values. This is the gap in literature this study intends to contribute. Participants are 250 lecturers who attended a professional development programme on assessment over the past five years at a study university of Technology in South Africa. The question posed in the study is: Towards extent are the skills and values explicitly, systematically and adequately assessed at a University of Technology? To answer this question a mixed method will be used. The quantitative data will be collected by means of survey questionnaires and the qualitative data by means of semi-structured interviews and document analysis (exam papers, test papers and assignments) to investigate how skills and values domains are assessed in higher education. Qualitative data will be analysed using the ATLAS ti and quantitative data using Statistical Package for the Social Sciences (SPSS).

Keywords: Assessment, 4th industrial revolution, Blooms trilogy, higher education.

1 INTRODUCTION

In the 21st century, the capabilities that people need for work, citizenship and self-actualisation are different from those of the 20th century. Society’s educational systems must transform their curricula objectives, pedagogies and assessments to help all students attain the sophisticated outcomes requisite for a prosperous, successful lifestyle based on effective contributions in work and citizenship. Therefore, education should prepare learners for a world in which expert thinking and complex communications (specialised jargon for a particular manner of expression) are the core intellectual capabilities by which people attain prosperity, economic security and maximise their potential. Higher order thinking, learning and performances are influenced by Higher Education, its curricula and assessment methods [1].

[2] points out that universities have ill-equipped graduate recruits, for the new demands placed on them by the working world. This author further states that despite the economy experiencing 450 000 vacancies for skilled graduates, 365 000 South African graduates are unemployed. The same sentiments reverberated by the director general of the British Chambers of Commerce (BCC), who stated that today’s learners often lack the personal skills, awareness and basic self-discipline that is essential in the workplace [3].

During attendance of teaching and learning at a university, learners are taught the knowledge, skills and values required in becoming competent in the field of specialisation. The knowledge domain seems to be meticulously assessed by written assignments, tests and exams. However, assessment of skills and values is often implicit, unsystematic and therefore inadequate [4]. Similarly, at the study university lecturers attends professional development programme on the assessment that intends to equip them with the new trends in teaching and learning. The challenge is that assessments instruments seem not to cover the skills and values required in the world of work. Academics feel that their assessments only cover the knowledge aspects of the modules. Over the years, most of the academics are frustrated and discouraged by the sense of assessing the aspects that relate to the skills and values domains when assessing learners. It is therefore worth noting as [5] stated that the
field of higher education, like any other field, is not static but constantly shifting, evolving and changing.

The researcher is the curriculum developer at a study university, his duties are to support, encourage and advice academics on aspects of their assessment design processes to name a few. The developments in society and economy require that educational systems equip young people with new skills and values which allow them to benefit from the emerging new forms of socialisation and to contribute actively to economic development under a system where the main asset is knowledge [6]. These authors state that these skills and values are often referred to as 21st century skills and values.

It is pointed out that a large majority of employers do not feel that recent graduates are well prepared for the current world of work [7]. In this regard, universities should make an effort to properly identify and conceptualise the set of skills and values required so as to incorporate them into the educational standards that every student should be able to reach by the end of their studies [6]. Education systems should transform the curricula objectives, pedagogies and assessments to help all learners attain the sophisticated outcomes requisite for a prosperous, successful lifestyle based on effective contributions in work and citizenship [1]. An international study has been conducted on the assessment of skills and values. The effective domain is the least applied and least understood of all Bloom’s Taxonomy trilogy [8].

The researcher has not come across any literature or study internationally and nationally that has investigated the explicitness, systematic and adequacy of assessing skills and values. This is the gap in literature this study intends to contribute. The purpose of the work in progress and the conceptual paper is to investigate the explicitness, systematic and adequacy of assessing skills and values in the lecturers’ assessment instruments using Bloom’s Taxonomy as a theoretical framework.

2 RELATED WORK

2.1 Assessment of 21st Century Skills and values

Initiatives on the teaching and assessment of 21st century skills and values originate in the widely-held belief shared by several interested groups, which are teachers, educational researchers, policymakers, politicians, Employers. 21st century will demand a very different set of skills and competencies (values) from people in order for them to function effectively at work, as citizens and in their leisure time [1 & 2]. The study conducted in several countries New Zealand, Canada & Poland to name a few revealed that these skills and values are not organised and that other countries claim to have integrated them in the teaching and learning programmes but when asked to indicate their explicitness, systematic and adequacy in their assessment instruments, none could provide details [6].

2.2 Assessment of 21st Century Skills and Values

Assessment frames what students do. It provides an indication of what the institution gives priority to in making judgements; it provides an agenda more persuasive than a syllabus or programme outline and it, therefore, has a powerful backwash effect on all teaching and learning activities [9] Assessment is more influential to learning behaviour and learners’ experience than teaching [10].

2.3 Characteristics of assessment in HE

Recently, educators, business leaders and policymakers in the United States have questioned whether the current design of assessment systems focuses too much on measuring students’ ability to recall discrete facts using multiple choice tests and structured essay questions at the cost of not adequately measuring a student’s ability to engage in and complete complex thinking and problem-solving tasks. The end results is a widening gap between the knowledge, skills and values students are acquiring at universities and the knowledge, skills and values needed to succeed in the increasingly global, technology-infused 21st century workplace. While the current assessment landscape is rife with assessments that measure knowledge of core content areas such as language arts, mathematics, science and social studies, there is a comparative lack of assessments and analyses focused on 21st century skills and values. Meeting the demands of today’s world requires a shift in assessment strategies as a means to better measure the skills and values that are highly expected [11].
There is a growing recognition that individuals need a wide array of skills and values in order to meet the needs of the modern workplace. Gone are the days when a multitude of jobs were available that required workers to perform simple manual tasks. The introduction of technology, particularly the use of computers, has changed the way that workers perform their tasks and the types of training, skills and values that workers need in order to complete these tasks. Research has shown that the use of computers has eliminated the need for humans to perform tasks that involve solving routine problems or communicating straightforward information [12].

3 THEORETICAL FRAMEWORK

In establishing the systematic, explicit and adequacy of assessment, a plethora of taxonomies for assessment exists. Of these frameworks, some of the popular taxonomies are Taxonomy of Problem Based Learning [13], Pedagogical Content Knowledge Taxonomy [14], Structure of the Observed Learning Outcomes Taxonomy [15] as well as Bloom’s Taxonomy of Educational Objectives [16].

This study use Bloom’s Taxonomy as a theoretical framework. Bloom's Taxonomy is often used as a framework when one is involved in the teaching and learning: design, delivery, Assessment, training, courses and lesson plans. In 1956, Benjamin Bloom along with a group for like-minded educators developed a framework for classifying educational goals and objectives into a hierarchical structure representing different forms and levels of learning. Bloom’s Taxonomy of Educational Objectives theoretical framework is used to examine the development the framework for systematic, explicit and adequate assessment of knowledge, skills and values.

3.1 Taxonomy of Problem-based Learning

Problem Based Learning was developed by [13] at McMaster University in response to the impoverished knowledge-base that medical learners accrued during their neurology clinical clerkship. Problem Based Learning (PBL) was viewed as a way for learners to integrate knowledge across module boundaries and develop problem solving skills [13]. These authors’ further states that PBL remain innovative nevertheless, its definition is elusive and its relationship to problem solving is unclear. In this regard, PBL involves deconstructing inherent notions of knowledge and thinking, and unravelling semantic knots [17].

Literature shows that there are three different perspectives on PBL [18]. The three PBL perspectives are process of inquiry, learning to learn, and cognitive constructivist approach. These perspectives define the purpose of PBL as helping learners to construct mental models of the world [18]. Its goal is to help learners develop flexible knowledge, effective problem-solving skills, learner directed learning kills, effective collaboration skills, active learning and intrinsic motivation [19]. PBL or Inquiry-based learning encourages learner centred approach on a complex problem that does not have a single correct answer as well as deepening understanding of complex subject matter [20]. PBL taxonomy seems to be covering a broad field of comprehension and understanding in an attempt to assist learners capture knowledge aspects of learning. This taxonomy lacks information on aspects related to skills and values as aspects of learning. Hence, this taxonomy will not be suitable for this study.

3.2 Taxonomy of Pedagogical Content Knowledge

Pedagogical content knowledge taxonomy is a way of describing the knowledge possessed by expert teachers [14]. Pedagogical content knowledge (PCK) is a type of knowledge that is unique to the teachers, and is based on the manner in which teachers relate their pedagogical knowledge (what they know about teaching) to their subject matter knowledge (what they know about what they teach). It is the integration or a synthesis of teacher’s pedagogical knowledge and their subject matter knowledge that comprise PCK 21. Furthermore, it is argued that PCK is the intersection and interaction of pedagogy and content knowledge and covers essential knowledge of teaching and learning content-based curricula, as well as assessment and reporting of that learning [22].

Seven categories of teacher professional knowledge have been identified by Shulman [21]as content knowledge; curriculum knowledge; general pedagogical knowledge; pedagogical content knowledge; knowledge of learners; knowledge of educational context and knowledge educational ends [23]. The general taxonomy of PCK addresses the distinctions within and between the knowledge bases of various disciplines, science subjects and science topics [14]. In this regard, PCK is essential for effective teaching as it emphasises learners’ prior knowledge, alternative teaching strategies in a particular discipline, common content-related misconceptions, how to forge links and connections
among different content-based ideas, and the flexibility that comes from exploring alternative ways of looking at the same idea or problem [22].

It is therefore evident from literature that the pedagogical content knowledge taxonomy is concerned with the ability to engage with learners on the understanding and competence of content [24 & 25]. This taxonomy would not be appropriate as the theoretical framework for this study, because it concentrate only on one dimension of the trilogy of knowledge, skills and values.

3.3 Taxonomy of Structure of the Observed Learning Outcomes

Structure of the Observed Learning Outcomes taxonomy describes the growth in complexity of performance in many learning tasks, from the earliest engagement in the task to expertise [15]. The authors further states that in Structure of the Observed Learning Outcomes (SOLO) taxonomy, learning grows along at least in two dimensions. The first dimension is the level of abstraction of the contents learned it is recognisable from infancy to adulthood. The second dimension is the cycle of increasing complexity, which implies that learning undergoes any given mode. The SOLO taxonomy describes five levels of student responses.

The SOLO taxonomy includes a useful progression, but it fundamentally focuses on the knowledge within the learner, not including the learning or knowledge creation that can occur between learners in a connected world [26]. SOLO taxonomy is an alternative to Bloom's cognitive domain that is commonly utilised in Higher Education [27]. It is against this backdrop from literature that the SOLO taxonomy is concerned with only five levels, which can only be equated to the cognitive domain of the bloom's taxonomy. This taxonomy would not be appropriate as the theoretical framework for this study, because it concentrate only on one dimension of the trilogy of knowledge, skills and values.

3.4 Taxonomy of Educational Objectives

The original Taxonomy of Educational Objectives was viewed as more than a measurement tool [16] (Bloom, 1956). This author believed that this Taxonomy could serve as a common language about learning goals. Its aim is to facilitate communication across persons, subject matter, and grade levels. Taxonomy of Educational Objectives is a basis for determining for a particular course or curriculum with specific meaning of broad educational goals [28]. For instance, those found in the currently prevalent national, state, and local standards. In this case, the Taxonomy of Educational Objectives is a means to determine the congruence of educational objectives, activities as well as assessments in a unit, course, or curriculum [29]. It is the panorama of the range of educational possibilities against which the limited breadth and depth of any particular educational course or curriculum could be contrasted [30].

Learning taxonomies or classifications are commonly utilised as a way of describing different kinds of learning behaviours and characteristics that we wish the learners to develop [27]. These taxonomies are often used to identify different stages of learning development [16]. Thus, provide a useful tool in distinguishing the appropriateness of particular learning outcomes for particular module levels within various Programmes [27]. The most common and earliest of these is Bloom's Taxonomy [16].

4 BLOOM’S TAXONOMY OF EDUCATIONAL OBJECTIVES FOR LEARNING

Bloom's Taxonomy of Educational Objectives for Learning framework was published as Bloom's Taxonomy of Educational Objectives. It consisted of three domains relating to The Cognitive Domain (knowledge or head based domain) consisting of six levels, encompassing intellectual competencies; The Psychomotor Domain (skills or hands based domain) consisting of seven levels, encompassing physical skills and The Affective Domain (attribute or heart based domain) consisting of five levels, encompassing values [31]. This author further states that each of these three domains consists of a multi-tiered, hierarchical structure for classifying learning according to increasing levels of complexity. In this hierarchical framework, each level of learning is a prerequisite for the next level. The taxonomy naturally leads to the classification of lower, middle and higher order learning.

4.1 The cognitive domain (knowledge or head based domain)

It involves the development of intellect. There are six major categories, which are in the hierarchy, starting from the simplest behaviour to the most complex. The categories can be thought of as
degrees of difficulties. The first ones must normally be mastered before the next ones can take place. Figure 1 represents the levels that are used to clarify the cognitive instructional objectives.

![Figure 1. Cognitive domain.](image)

4.2 The psychomotor domain (skills or hands based domain)

It includes physical movement, coordination, and use of the motor-skill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution.

The seven major categories are listed from the simplest behaviour to the most complex. Figure 2 represents the levels that are used to clarify the psychomotor instructional objectives.

![Figure 2. Psychomotor Domain.](image)

4.3 The affective domain (attribute or heart-based domain)

The Affective Domain addresses interests, attitudes, opinions, appreciations, values, and emotional sets. This domain includes the manner in which we deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivations, and attitudes.

The Taxonomy is hierarchical (levels increase in difficulty/sophistication) and cumulative (each level builds on and subsumes the ones below). The levels, in addition to clarifying instructional objectives, may be used to provide a basis for questioning that ensures that students' progress to the highest level of understanding.
If the teaching purpose is to change attitudes/behaviour rather than to transmit/process information, then the instruction should be structured to progress through the levels of the Affective Domain. Figure 3 represents the levels that are used to clarify the affective instructional objectives.

5 METHODOLOGY

The focus of this paper was to present the conceptual paper and the work in progress. The results and findings are not presented in this paper. In this case, it is important to indicate the methodology used in this study. Participants will be 250 lecturers who attended a professional development programme on assessment over the past five years at a study University of Technology in South Africa. Purposive and simple random sampling techniques will be used to select participants. Purposive sampling is based on the assumption that the investigation wants to discover, understand and gain insight into the phenomena and therefore must select a sample from which the most can be learned [32]. Simple random sampling, every individual in the sampling frame has an equal and independent chance of being chosen for the study [33].

The question posed in the study is: Towards extent are the skills and values explicitly, systematically and adequately assessed at a University of Technology? To answer this question a mixed method will be used. The mixed method is the mixture of qualitative and quantitative approaches that provides a better understanding of research problems than either approach alone [34 & 35]. The quantitative data will be collected by means of researchers developed instruments Bloom’s Systematic Inventory as well as Bloom’s Trilogy Inventory survey questionnaires.

The qualitative data by means of semi-structured interviews and document analysis (exam papers, test papers and assignments) to investigate how skills and values domains are assessed in higher education. Qualitative data will be analysed using the ATLAS ti and quantitative data using Statistical Package for the Social Sciences (SPSS). These two analytical tools will ensure that the different but complementary data collected is analysed and valid. Data analysis is primarily an inductive process of organising data into categories and identifying patterns (relationships) among them [36]. These instruments will assist the researcher to develop a framework for designing technically sound skills and assessment instrument to ensure that skills and values are explicitly, systematically and therefore adequately assessed.

6 CONCLUSION

The study investigates the extent at which the skills and values are explicitly, systematically and adequately assessed at a University of Technology in South Africa. Lecturers at the study university, feel that their assessments only cover knowledge aspects of the modules. The lecturers seem to be struggling in assessing the aspects that relate to the skills and values domains when assessing learners. On the other hand, the industry seems not to be satisfied with the graduates from Universities and complaints seems to be based on the same concerns the lecturers are having. The study intends to contribute to the body of knowledge by offering the lecturers a framework for
designing technically sound skills and values assessment instrument as well as enriching the curriculum. In this regard, it is hoped that the framework for assessing skills and values not only will it assist the lectures’ design good assessments but will also assist in improving student skills and values.

REFERENCES


