

Assessment of Learning in Health Sciences Education: MLT Case Study

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Abstract

Assessment in health sciences education has become an extremely critical issue in recent years, given the rapidly changing disease patterns and behavioral changes in communities among diverse cultural and economic contexts of patients. Globally, there is increasing demand for highly qualified contemporary healthcare professionals. Subsequently, learner assessment regimes need to have the capacity to accurately evaluate the competences (i.e. attitudes, skills and knowhow) acquired during the training of healthcare professionals. This paper provides an analysis of assessment of and for learning in health sciences education with a focus on clinical laboratory training at MLT in Uganda. This study utilized both quantitative and qualitative research designs. The program evaluation design principles were also utilized to measure the levels of compliance towards attainment of curriculum outcomes. The instruments used during data collection included checklists, questionnaires, indepth interviews, and focus group discussions (FDGs). The findings of this study showed that learners were achieving the intended curriculum objectives progressively. The assessment tools used were prepared through a rigorous process to ensure that the basic principles of assessment are identified and integrated during curriculum design and implementation. Results of the study also showed that adequate institutional administrative support available enhanced the teaching and learning processes and ensured that appropriate curriculum assessment schedules and strategies were strictly followed as stated in the elements of the curriculum structures. This contributed meaningfully in preparing competent contemporary healthcare professionals (clinical laboratory technicians). It was recommended that all healthcare professional training institutions should take the use of authentic assessment of and for learning very seriously.

Keywords: *assessment of learning; health sciences education; clinical laboratory training; curriculum assessment; blended research methods*

Assessment does not only continue to be a key activity of teachers, but also has become a key focus of educational research throughout the world (Cumming & Wyatt-Smith, 2009, p. 1).

1. Introduction

Assessment of curriculum achievement is an important component of curriculum implementation. It helps educators to know whether their strategies and techniques are achieving the intended outcomes. More importantly it helps learners to appreciate whether they are actually learning and how they are achieving the curriculum intentions.

In healthcare professional education and training there are many contextual issues which affect the learning of students and practice of the graduates. These issues include laws, ethics, discoveries in research, innovations in industry and changing behavioral patterns among patients and clients. Marketing strategies and practices of instruments, tools and other materials used in clinical practice. Specifically, in education and training of healthcare providers, the rapid advances in health sciences knowledge and skills, changing behavior of patients and clients, manufacture and marketing of reagents and pharmaceutical materials and ethical standards required of healthcare professionals are key in the education of healthcare professionals (Liston, Wagener, & Miller, 2013). As such, healthcare professions should demonstrate a good understanding of the aforesaid critical issues. Assessment of and for learning these critical issues in health sciences education may not happen as needed. Yet, assessment of and for

learning in health sciences education needs to focus on the polyvalent, diverse and dynamic issues of training which affect the practice of healthcare professionals after their graduation. However, this may not be a reality in many insitutions offering health sciences education.

1.1 Purpose of the Study

This paper presents a critical review of the issues eluded to the assessment of and for learning in health sciences education and investigates whether and how they are addressed at the Medical Laboratory Technology (MLT) training at Mulago in Uganda. This narrative presents the literature review, methods, study results, discussion and conclusion of the study.

1.2 Literature Review

Assessment of curriculum achievement is critical in formal education. Jonassen (2004) suggests that assessment is a very important component in formal education given that students get to know what is important from what is being assessed. Indeed, what is being assessed often influences students' revision as they prepare to take the test or final examinations (Frankland, 2007). As such, assessment drives activities that students engage in, which underpin their learning. So, careful design of an assessment strategy (not tasks or items) can ensure that students engage with the associated learning resources provided and in learning activities that lead to the desired learning outcomes (Meyers & Nulty, 2009, p. 12). Wilson Rwandembo Mugisha (2011) concurs that assessment remains to be an important component of the curriculum structure. It is a form of educational measurement that is used to ascertain whether learning is actually taking place. Assessment is also defined as a way of determining how much a learner has learnt (Abbatt, 1992; Amri, Ngatia, & Mwakilasa, 1993). This is also referred to as assessment of learning.

The purposes of assessment are many and may range from providing diagnostic information about the student's academic progress to improving the educational program in general (Mislevy & Knowles, 2002; Talukdar & Aspland, 2012). Assessment is aimed at measuring the extent to which learners achieved the present program aims, goals and objectives and levels of attaining the attitudes, skills, and knowhow (Amri et al., 1993; Spady, 1994). It is also done to grade learner performance, give feedback to learners, determine the effectiveness of teaching, predict the future performance of learners and to rank graduates for purposes of awarding qualifications and certificates. However, Jonassen (2004) observed that many teachers do not actually know how to design and implement quality assessment tools that are capable of measuring whether meaningful learning is taking place or not. This is also referred to as assessment for learning. Yet, assessment for learning or measuring whether meaningful learning is taking place would be the main essence of any assessment efforts.

Assessment can be classified as either normative or criterion referenced (Downing & Yudkowsky, 2009; N. E. Gronlund, 1990). **Normative assessment** describes the learners' achievement in relation to previous performance or with a specific group of learners (Abbatt, 1992). Normative assessment compares scores of learners in the same domain. It has limited scope and therefore, it is not used to assess the standard of an educational system or the whole population. However, in order to make the scores more meaningful, they can be compared with that of an external representative group of learners.

Criterion-referenced assessment means that the students' achievement is judged against an absolute and pre-determined standard or pass grade (Abbatt, 1992; Downing & Yudkowsky, 2009). It relates the learners' scores with the behavior that is expected of learners with such a score. As such, the passing or failing of the learner is based on pre-determined levels of acceptable performance. The assessment determines the learner's performance in a specified domain. The assessment aims at testing mastery levels among learners (English & Steffy, 2001; Talukdar & Aspland, 2012). For consistency, it is important that a test criterion for a particular domain is specified. According to William (1999) criterion referenced assessment helps to determine and inform future teaching and meaningful learning are addressing the real learning needs.

Assessment of meaningful learning can be approached in various forms and contexts. It can be either product (summative) or process (formative) assessment. Therefore, assessment may serve both formative and summative purposes (Birenbaum, 2003b, p. 28).

1.3 Formative Assessment

Different people perceive formative assessment differently. Irons (2008, p. 7) defines formative assessment as any task or activity which creates feedback (or feed forward) for students about their learning. Formative assessment quite often does not [necessarily] carry a grade which is subsequently used in a summative judgment. Therefore, formative assessment is often referred to as continuous assessment usually done during the program implementation. It is developmentally-oriented in promoting the acquisition of knowledge and skills. Therefore, formative assessment

can be used to enhance learners' learning outcomes through their engagement with a variety of assessment activities and feedback (Irons, 2008). As such, formative assessment may be used as a tool to identify the needs of the individual and tailoring learning to their needs...and thus facilitating the learning process (Looney, 2008, pp. 23-24). During curriculum implementation, there are three forms of formative assessment, namely: *teacher designed assessment*, *self-assessment* and *peer assessment* (Abbatt, 1992). **Teachers' designed assessments** are developed by teachers to evaluate the learning progress of their learners and to identify the gaps in their learning. This helps teachers to accordingly adjust their teaching and learning activities to meet the needs of their learners. However, as earlier indicated, teachers' knowledge of designing and implementing meaningful assessment tools is usually very limited, which is likely in most cases to undermine the quality of assessment (Jonassen, 2004).

Self-assessment involves learners measuring their own performance and making important decisions regarding their future progress (Abbatt, 1992; P. J. Black, 1999; P. J. Black & William, 1998). P. Black, Harrison, Lee, Marshall, and Wiliam (2005) also suggest that self-assessment is essential to the learning process as it enhances students' ability to develop and overview their own work so that it becomes possible for them to manage and control it for themselves. This promotes learners' ownership of their own learning. However, it is important to note that even though learners may lack the necessary skills both to judge specific problems in terms of their understanding and to set realistic targets to remedy problems within reasonable time frames (P. Black et al., 2005), their learning outcomes may still improve through their engagement in self-assessment activities. Self-assessment may thus lead to deeper learning as learners have the opportunity to reflect and judge the quality of their work based on clear criteria and standards set by themselves with guidance of their teachers (Frankland, 2007; Robinson & Udall, 2006). For instance, P. Black et al. (2005, pp. 49-50) indicated that teachers who created classroom environments where students worked together on understanding teacher's comments about their work, provided the training to students on the need to judge their own learning and making an effort to improve. Certainly, self-assessment teacher-supported environments offer learners opportunities for constructing their own meaning and knowledge in numerous credible ways. For instance, Topping (2003, p. 56) observed that through self-assessment learners are able to plan their own learning, identify their own strengths and weaknesses, determine target areas for remedial action and develop meta-cognitive and other personal and professional transferable skills. In essence, self-assessment helps learners to take responsibility in their own learning and to construct their own meaning. Therefore, self-assessment is an important tool for self-improvement of individual learners.

Peer assessment entails assessment of learning among co-learners. Peer assessment helps strengthen the student's voice and improves communication between students and their teachers during the teaching and learning processes and enables students recognize their own learning needs and to inform the teacher about these needs (P. Black et al., 2005, p. 50). As part of peer assessment learners and their instructors may also develop criteria for assessing particular projects as a group effort, thus, providing more opportunities for learners to develop ownership and to internalize the criteria (Looney, 2008, p. 136) especially during their interaction with the curriculum content and instructional activities. P. Black et al. (2005, p. 50) also contend that when students actively engage in peer assessment in the classroom, the teacher can be free to observe and reflect on what is happening and to frame helpful interventions. Teachers may also engage in interventions that could lead to the implementation of remedial provisions to support especially struggling learners in terms of their learning outcomes. Interestingly, evidence has also shown that peer assessment can actually lead to substantive gains in the quality of learning (Segers, Dochy, & Cascallar, 2003a; Topping, 2003). This is possible mainly due to the fact that learners are meaningfully engaged in the learning and assessment process, as they develop skills for both self- and peer-assessment. In particular, learners may negotiate with their teachers for the teaching goals and methods to be used during the curriculum implementation. However, for effective peer assessment to occur, feedback becomes central especially when learners and teachers are given the opportunity to focus on both the *process of learning* as well as *learning outcomes* (Looney, 2008, p. 24). Similarly, Robinson and Udall (2006, p. 93) contend that feedback is most useful when it is regular and timely and closely related to the outcomes of learning activities. This implies that feedback should be given when the course or instruction is still on. Therefore, peer assessment assists learners to appreciate their own learning gaps and helps teachers to adjust their teaching accordingly to meet the identified individual needs, which is critical to the concept of formative assessment (Looney, 2008). Interestingly, numerous scholars concur that peer assessment is an important aspect of formative assessment (Abbatt, 1992; P. J. Black, 1999; Griffin, 2009; William, 1999, 2000).

It is also important to note that at the MLT educators (internal assessors) carry out formative assessment while an external assessor; usually an external assessment body, initially, Makerere University and now the Uganda Allied Health Examinations Board (UAHEB) - is used to validate the internal assessment mechanisms of the school (Norman E. Gronlund & Linn, 1990). In other words, the assessment was carried out by the institution and

moderated by UAHEB. The scores from formative assessment contributed 30 percent of the learners' final grade on coursework at the end of each semester.

1.4 Summative Assessment

Summative assessment is also extremely vital in accomplishing educational purposes and objectives. Irons (2008) defines summative assessment as any assessment activity capable of generating a mark or grade that can subsequently be used to make an informed judgment on student's performance. Ultimately, the judgment using scores generated from summative assessment assists in the classification of awards at the end of a course or program. Therefore, summative assessment involves the conducting of terminal examinations for purposes of generating scores/grades used to award appropriate qualification and certification. It is comprehensive and is used to check the level of learning at the end of the program/course (Bardes & Denton, 2003; Downing & Yudkowsky, 2009). Therefore, the primary purpose of summative assessment is to measure what students have learned during the course of instruction (Downing & Yudkowsky, 2009, p. 15). As such, it tests cumulative learning experiences to ensure that learners have achieved the intended program goals, and it may take the form of tests or examinations. Thus, summative assessment puts emphasis on marking and grading learners in order to get either the best or the worst performing learners. The results of summative assessment not only affect the academic future of learners per say, but may also influence their future career opportunities. Indeed, the results of summative assessment often influence important decisions that might affect learners' future professional career paths such as admissions into college, and employment in the world of work. However, summative assessment also has its own limitations. For instance, because summative assessment tends to be comprehensive in terms of subject content, its coverage as such may not be able to effectively measure the mastery of all important key concepts learned (Earl, 2003; Marzano, 2006). It may, therefore, be detached from the processes of teaching and learning that could enhance learner improvement (P. J. Black & William, 1998). This may in turn disadvantage many learners because of its failure to measure and reflect their own actual performance potential in terms of their attitudes, skills and knowhow.

Nevertheless, in recent years there is a paradigm shift in assessment practices. Birenbaum (2003b) observed that increasingly assessment practices are changing from utilizing single total scores for ranking learners, as traditionally used in the testing culture, to descriptive profiles that provide multidimensional feedback for fostering learning. Birenbaum further contends that this concept of descriptive profiles changes the position of the learner during the assessment process from that of being a passive, powerless, often oppressed, subject who is mystified by the process, to being an active participant who shares responsibility in the process. To this effect Robinson and Udall (2006) are also in agreement. For instance, students will gain a better understanding when they are given opportunities to participate in the development of the criteria and the standards for evaluating their own performance (Birenbaum, 2003b, pp. 22-23). This approach makes assessment more authentic and meaningful. This is consistent with Birenbaum's argument that "tasks typically involving investigations of various types, are meaningful and authentic to the practice in the discipline, and they aim at being interesting, challenging and engaging for the students, who often perform them in teams. Upon completion of the task, students are frequently required to exhibit their understanding in a cumulative manner" (2003b, pp. 23-24).

In practical terms, this is always a challenge to capture students' cumulative academic progress on a continuous basis. To compound this challenge, even further, is the fact that most teachers lack the basic skills of developing authentic meaningful assessment tools as earlier indicated. Jonassen (2004, pp. 146-147) concurs that "constructing and applying authentic meaningful assessments is a complex skill that many educators do not possess, and it is much harder work than constructing recall test items. Thus, educators have to develop these skills; moreover, meaningful learning requires more than one form of assessment." Authentic assessment tools may be more demanding for educators as they involve measuring of students' competences from real life situations as opposed to examination room settings (Cumming & Maxwell, 1999).

However, at MLT training program, a variety of assessment tools such as logbooks, examination question papers, checklists, field reports, and teachers' observations of students during clinical laboratory practices have been used to measure the learners' levels of acquiring attitudes, skills, and knowhow as well as ethical understanding of the long-term implications of learning outcomes. This is with particular emphasis on the impact of clinical laboratory practices to the individual patient as well as the community. Furthermore, this builds the trust of the community in the clinical laboratory practices specifically and delivery of healthcare services in general.

Mugimu and Mugisha (2013) mentioned that students at MLT were satisfied with the assessment schedules and procedures as well as assessment strategies, which reduced their unnecessary nervousness and tensions that usually accrue from taking examination. The assessment strategies that encouraged the use of group discussions to enhance

reflection were found to be more flexible and allowed students to take responsibility of their own learning.

1.5 Learning Theories and Assessment

Learning theories should inform assessment decisions. Wilson Rwandembo Mugisha and Mugimu (2015) contend that decisions for determining assessment strategies of learning outcomes should be guided by relevant learning theories such as constructivism (i.e. Self-directed experiential learning) and cognitive learning theories. For instance, contemporary theories of learning and knowing assume that knowledge is represented, organized, and processed in the mind. Furthermore, Pellegrino, Chudowsky, and Glaser (2001, p. 3) contend that the social dimensions of learning including social and participatory practices that support knowing and understanding [are critical thus], assessment practices need to move beyond focusing on component skills and discrete bits of knowledge to encompass the more complex aspects of learner achievement. Therefore, assessment of learning at MLT also emphasized both theoretical and practical skills, which facilitated substantive acquisition of knowledge – which enabled learners to develop into well grounded competent healthcare professionals (W. Rwandembo Mugisha & Mugimu, 2012; Liston, Wagener, & Miller, 2013).

1.6 Reliability and Validity

Reliability and validity are vital elements of assessment. Norman E. Gronlund and Linn (1990) suggest that tests should also satisfy the reliability and validity criteria. Reliability refers to precision and accuracy of a test. Based on this criterion, the assessment should be able to accurately measure the performance of learners and produce stable and consistent results that can be applied reliably under comparable conditions. Validity on the other hand, refers to the ability of a test instrument to measure what it was intended to measure. In addition, the test should also sufficiently cover the key concepts of the curriculum content. This gives the test content validity.

Validity is usually lower in self-assessment and peer assessment compared to the use of professional teachers designed assessment tools (Segers, Dochy, & Cascallar, 2003b; Topping, 2003). This is understandable because teachers are already professionals in the teaching-learning practices and in addition are more knowledgeable and experienced in curriculum content compared to their learners/trainees. Nonetheless, in this type of assessment the learner is a novice in assessment and may not be able to interpret the curriculum objectives as required. Be it as it may, however, it is a good practice for a learner to participate in the setting of targets and measuring the rate of their achievement irrespective of the degree of validity. Teachers need to be encouraged to administer such appropriate assessments in order to guide their learners in improving their learning outcomes. Figure 1 illustrates that the use of appropriate assessment approaches may lead to increased learners' interest in learning activities and as a result teachers are in a better position to understand their learners' learning outcomes. The philosophy of assessment therefore should be guided by a learner-centered pedagogical approaches to learning, teaching and assessment. In this regard, adequate institutional administrative support is vital to ensure utilization of appropriate assessment methods and procedures as well as realization of the curriculum objectives.

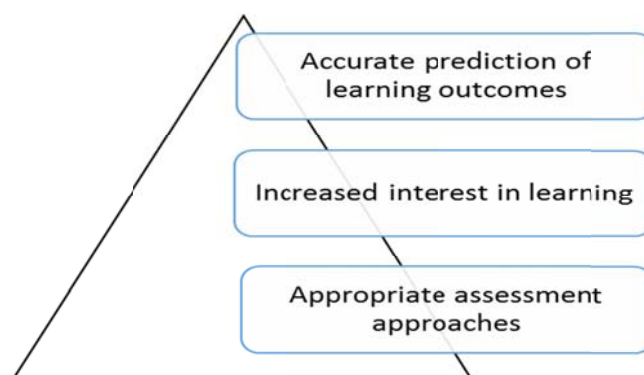


Figure 1. Role of Appropriate Assessment in Learning

Curriculum content, instruction/teaching strategies and assessment of learning form the main part of curriculum implementation (Wilson Rwandembo Mugisha, 2011). It should also embrace the ethical standards of honesty, trust, fairness, respect and responsibility, underpinned by the “*guiding principles*” that shape the learning outcome/objectives.

1.7 Curriculum Content, Instruction and Assessment

For assessment to fulfill this role “more emphasis [should be] placed on the congruence between instruction and assessment, which should both focus on stimulating the development of competences needed to flexibly perform various professional roles and on stimulating reflection and lifelong learning skills by involving learners as active participants in the learning process” (Gulikers, Sluijsmans, Baartman, & Bartolo, 2009, p. 174). This emphasizes the need to pay particular attention to the connection between the three pillars of learning namely; **curriculum content**, **instruction/teaching** and **assessment**. Figure 2 illustrates the three pillars of learning. It is important to note that the three pillars of learning are complementary to each other. However, assessment determines the success of the other two pillars. Downing and Yudkowsky (2009, p.9) concurs that “assessment and instruction are intimately related....instruction/teaching, learning, and assessment form a closed circle, with each entity bound to the other.” By aligning assessment to curriculum content and instruction subsequently enhances the achievement of testing aims and objectives (Bunch, 2012). This is done with particular emphasis on optimizing the evidence for acquiring the needed competences and fulfilling the desired learning outcomes of individual learners.

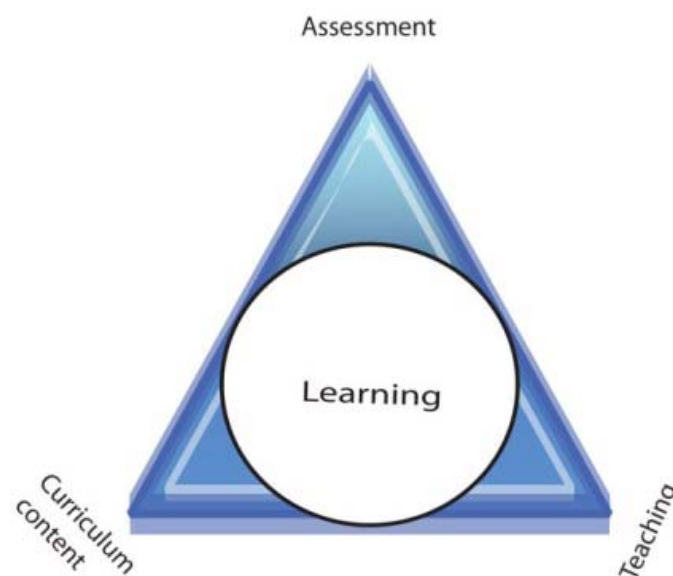


Figure 2. Illustrate the Pillars of Learning

Ultimately, as observed by Giggs (2003), and Taylor (1994) assessment should aim at testing individual attainment of the desired learning outcome based on the standard of performance and criteria as a way of making a holistic judgment of an individual’s learning achievement.

1.8 Assessment Methods

Typical assessment methods in healthcare professions are many and widely documented in literature. Downing and Yudkowsky (2009) highlighted the following commonly used assessment methods in healthcare professions that include: written tests, performance tests, clinical observation methods, and oral examinations. As earlier indicated the use of a combination of these assessment methods/tools is likely to be more ideal to produce better and reliable results. At the MLT a variety of assessment methods were being utilized. However, educators and clinical supervisors continued to be challenged to evaluate and show whether their trainees are able to effectively function in the world of work through the application of appropriate assessment methods. As such, assessment continues to play a crucial role in the whole learning process (Gulikers et al., 2009).

1.9 Research Questions

The research questions that guided this study included: (1) to what extent the basic principles of assessment were integrated in curriculum design and implementation in the MLT training programs? (2) Are learners achieving curriculum targets progressively? (3) Does MLT as the training institution give adequate administrative support to enhance the teaching and learning processes? (4) Are the instructors following appropriate curriculum assessment

schedules documented in the official curriculum? (5) Are assessment strategies aligned with curriculum objectives? (6) Are the assessment tools being used reliable and valid?

2. Method

This study utilized both the quantitative and qualitative research designs (Babbie, 1990, 2013; Babbie & Mouton, 2007; Baker, 1999). The study used checklists and questionnaires during data collection. Data collection was done by checking the levels of compliance with assessment practices by the curriculum designers during curriculum development as well as administrators during the curriculum implementation processes. The checklists were therefore used during the curriculum document review and in focus group discussions of respondents (i.e. learners, educators and clinical supervisors). Questionnaires were used to collect views of learners with regard to assessment practices applied by the instructors/educators during the implementation of the diploma MLT curriculum. The quantitative research design was applied in measuring the rate of compliance of the curriculum implementation process as compared to the curriculum development recommendations. The respondents' ratings of compliance to assessment and recommendations in the curriculum documents were recorded. The qualitative data was also gathered from respondents through focus group discussions in order to get their impressions regarding the way the assessment of and for learning was planned and implemented (Strauss & Corbin, 1990). In addition, the researchers utilized program evaluation design principles in measuring the levels of compliance towards attainment of curriculum outcomes by learners (Stake, 1967). Program evaluation design principles used included determining utility levels of curriculum content, ensuring proper evaluation of instruments that were used in the study, utilizing of both quantitative and qualitative oriented questions and involvement of local stakeholders in meaningful ways (Goodman, 1998).

3. Results

The first research question probed for how **the concepts of assessment were integrated in curriculum design and implementation in the MLT training program**. The findings from document analysis revealed that the assessment of learning in the MLT training programs actually followed the standard criteria and procedures for setting of assessment tools. For instance, a careful review of past papers from the question banks examined were found to fulfill all criteria of a standard assessment instrument. In addition, assessment tools were found aligned to curriculum objectives, content and instructional strategies.

The second research question investigated *whether learners were achieving the intended curriculum targeted objectives progressively*. Findings arising from studying individual learners' college files as well as examination records showed that learners were actually progressively achieving the intended curriculum objectives. For example, Table 1 presents the learners' annual average pass rate for seven years between 2000 and 2007. The overall annual average pass rate was 74%. This is on the whole a good performance and majority of learners successfully passed and progressed well. This is an indicator of high learner transition rates in the program. This also may suggest that assessment during the curriculum implementation was in line with the intended curriculum objectives and learning outcomes. It also means that learners were achieving the prescribed learning outcomes of the curriculum. As a result the required competences were possibly being acquired.

Table 1. Showing Examination Results of MLT by Year for a Period 2000-2007

Year	2000	2001	2002	2003	2004	2005	2006	2007
Number of Candidates	36	41	43	50	45	18	63	77
Number of Candidates passed	32	31	27	40	37	12	44	48
Percentage (%)	89	76	63	80	82	67	70	62

Average pass rate per year = 74%

Regarding the quality of learners in terms of their competences, discussions with instructors also revealed that the learners met the standard required for the MLT program. This is reflected in the following quotation obtained in the focused group discussions of educators: *we are not surprised by the good performance of our learners basing on the good grades they had at the time of admission (FGE)*. This was consistent with examination results records (SMLT Examinations Results, 2000-2007) shown in table 1. The instructors/educators further asserted that learners are quick at learning both theoretical and practical curriculum components of the program.

The third research question **probed for** the adequacy of the institutional administrative support given to the teaching and learning process. The findings in table 2 revealed that the **institutional** administrative support was 100% in compliance with the teaching and learning processes and activities. Table 2 below shows that curriculum implementation was provided with adequate institutional administrative support for the assessment process consistently with curriculum recommendations (standard criteria and procedures).

The findings in table 2 also revealed that the curriculum implementation process was 92% in compliance with the learners' progressive assessment process as a strategy of testing achievement of learning outcomes. This is also consistent with the results of research question two above.

Table 2. Shows Compliance of Administration to Curriculum Frameworks

Item	Complies	Partially complies	Total compliance	Does not comply	Total
Assessment process	12	1	13	1	14
Administrative support	7	1	8	0	8

Research question 4 **investigated whether instructors followed appropriate curriculum assessment schedules documented in the official curriculum.** Results from the investigations revealed that curriculum schedules were being strictly followed. This is reflected by the responses gathered from the focus group discussions. For instance, educators and clinical supervisors emphasized that: *schedule/time of assessment, curriculum content, and the nature of assessment were well known to them....* [furthermore] *We help learners to be ready for the several assessments because we know how they are arranged in the curriculum* (FGE and FGS). This clearly shows that educators and clinical supervisors were in agreement that during the curriculum implementation process, the guidelines and procedures were strictly followed, as reflected by the following quotation:

And assessment guidelines of what to assess were also well described in the curriculum document (FDE). We know exactly when we are supposed to carry out the assessments, the section of the curriculum that needs to be assessed and the type of assessment that needs to be administered.

Interestingly, the learners also concurred with the educators and clinical supervisors regarding assessment schedules and curriculum content. For instance, results in table 3 clearly show that learners agreed that assessment was done on schedule and tested their understanding as well as adequately covered the curriculum content. This is reflected in the following quotation of learners: *we knew the period for assessments and the curriculum content areas where assessment came from (FGL).*

Research question (5) Are assessment strategies aligned with curriculum objectives?

As reflected in table 3 the assessment strategies were aligned to important curriculum elements. The learners agreed that assessment was testing adequately the curriculum content at 81% and acquisition of skills at 88%. The depth of curriculum content and levels of performance of specific skills are described in the curriculum objectives. This high level of agreement among respondents is a confirmation that the assessment strategies were aligned to the intended curriculum objectives.

Research question 6- Are the assessment tools being used reliable and valid?

Results of the investigation revealed that assessment tools used were of high quality. The quality of assessment tools was evaluated on key assessment criteria by the learners. The results in table 3 clearly show that learners agreed that all the key assessment criteria were followed in the setting of their tests and examination papers. This is evidenced by the high total agreement percentage ranging from 54% to 95%.

Table 3. Shows Learners' Perceptions by Relevancy of Assessment Processes

Assessment Criteria	Strongly Agree	Agree	Total Agree	Disagree	Strongly Disagree	Total Disagree
Benefit learners	11	23	34(54%)	21	8	29
Tests learners' understanding	16	33	49(78%)	10	4	14
Different forms of assessment used	21	26	47(75%)	11	5	16
Covers curriculum content adequately	18	33	51(81%)	8	4	12
Tests acquisition of skills	30	25	55(87%)	8	0	8
Learners' assessment records are kept	21	26	47(75%)	11	5	16
Assessment criteria known to learners	25	35	60(95%)	3	0	3
Examination meets standard criteria	25	35	60(95%)	3	0	3
Curriculum schedules are followed	21	26	47(75%)	12	4	16
Grading of learners' scores is as recommended in curriculum	30	25	55(87%)	8	0	8

At MLTP the end of semester assessments were carried out externally by the external examinations bodies (formally Makerere and now UAHEB) which is an independent national examination body. Generally our analysis of the results show that the pass rates of candidates are high in these examinations as reflected in table 1. The assessment tools are designed by the board using a pool of healthcare educationists and practitioners. The review of documents showed that the design of the examinations test items on assessment tools goes through a long rigorous process which involves drafting, moderating, proof reading and editing that is done by different groups of healthcare professionals. The review of the documents further indicated that the UAHEB also conducted regular curriculum harmonization seminars with stakeholders (educators and clinical supervisors) who participate in the actual curriculum implementation. The exercise of designing the assessment tools was always proceeded by seminars and workshops designed to update the examiners on the principles and concepts in assessment of and for learning. The review of past papers from the question banks also revealed that the past papers contained questions which fulfilled all key criteria of a standard assessment instrument as indicated in table 3 above.

4. Discussion

The role of assessment in health sciences education cannot be underscored especially in recent years, given the rapid changes in disease patterns and behavioral changes in communities among diverse cultural and economic contexts of patients. Globally, there is increasing demand for highly qualified and competent practitioners in healthcare service delivery (Liston, Wagener, & Miller, 2013). Learner assessment regimes need to have the capacity to accurately evaluate the skills and competences acquired during training. This paper provides an analysis of assessment of and for learning in health sciences education with a focus on clinical laboratory training.

In this study, findings revealed that generally a variety of assessment tools were used for monitoring the progress of learners within the semester and also for promotion from one level of learning to the other. Assessment served both the formative and summative purposes in monitoring the progress of and for learning. This is in agreement with the existing literature that assessment of and for learning has various purposes that should vary according to the level and type of education (Birenbaum, 2003a; Topping, 2003). The discussion section is organized based on each of the research questions.

The first research question probed for how **the basic concepts and principles of assessment were integrated in curriculum design and implementation in the MLT training program**. The findings from the study revealed that assessment of and for learning in the MLT training programs actually followed the basic concepts and principles as stated in the curriculum documents. It was also revealed that the assessment practices used were in agreement with existing literature. It also came out clearly that the assessment practices used involved both formative and summative assessment approaches. The formative assessment had instructor/educator designed types as well as self- and peer-assessment formats. It is important to note that peer- and self-assessment approaches emphasized learner-centered principles of assessment. Wilson Rwandembo Mugisha (2011) and Robinson and Udall (2006) are also in agreement that assessment of and for learning should be guided by learner-centered principles in order for the learners to

appreciate and own it. This is also consistent with existing literature that formative assessment approaches are important in enhancing the diagnosis and addressing of individual learners' learning needs (Looney, 2008). At MLT, this has made the learning interesting, relevant and meaningful evidenced by the learners' high pass rate as reflected in table 1.

Another interesting finding of the study is that the MLT assessment practices were the inclusion of instructors/educators designed assessment tools. The instructor designed assessment tools in numerous meaningful ways, which strengthened the monitoring of the learning process given the current technical expertise and experiences of instructors at MLT in assessment development skills. This is in line with Abbatt (1992) views that instructor designed assessments should be guided by the technical knowledge of educators and hence are superior in quality as compared to peer- and self- assessment regimes generated by learners.

From the foregone discussion, it is reasonable to mention that basic assessment concepts and principles were applied which made the assessment practices appropriately integrated and comprehensive during the curriculum implementation. The application of intergrated and comprehensive assessment practices ensures quality and dependability of the results. This is consistent with Jonassen's (2004) argument that a single form of assessment, cannot ensure effective assessment or measurement for acquiring problem-solving skills and competences. Rather, as Abbatt (1992) suggests that an effective learning assessment system should be intergrated and comprehensive enough to the extent that it should incoperate a wide range of forms of assessment that are consistent with curriculum frameworks and structures. This is in line with literature which suggests the need to ensure that appropriate alignment of assessment with the teaching and instructional objectives is done as stated in the existing curriculum frameworks and structures (Biggs, 2002; Bunch, 2012; Talukdar & Aspland, 2012).

From this study it is clear that several forms of assessment practices were applied and integrated in curriculum implementation at MLT. Assessment practices in the MLT training in Uganda therefore were in agreement with the basic assessment concepts and principles recommended in literature (Birenbaum, 2003b).

The second research question investigated **whether learners were achieving the intended curriculum targeted objectives progressively**. Findings arising from careful review of individual learners' college files as well as examination records showed that learners are actually progressively achieving the intended curriculum objectives. The examinations results covering a period of eight years in table 1 show an average pass rate of 74%. This is a good performance in the context of MLT. The research findings with regard to assessment of and for learning also provided concrete evidence that learners were aware of the important curriculum content areas they were expected to be assessed on every semester. In fact, 81% of the learners agreed that the assessment tools were covering curriculum content adequately while 88% also agreed that required knowledge and skills were acquired. This is an indication that they were progressively achieving curriculum targets. In this respect the assessment at the MLT School was fulfilling its curriculum objectives/aims especially in measuring learners' achievement as far as acquiring relevant attitudes, skills and knowhow needed for the contemporary healthcare professionals is concerned (Amri et al., 1993; Spady, 1994).

The learners, as indicated in table 3, agreed that the assessment graded them correctly (88%), helped them to learn (54%) and correctly tested their understanding (78%). This in itself is also an evidence that the assessment practices were meaningfully testing progressive achievement of the learners. The 74% overall annual average pass rate of over seven years performance is yet another evidence that the learners were achieving the intended curriculum objectives and learning outcomes. This is also in agreement again with (Biggs, 2002) to the extent that assessment practices should be aligned to teaching and instructional/curriculum objectives.

The third research question **probed for** the adequacy of the institutional administrative support given to the teaching and learning process. The findings indicate that institutional support was adequately given to the teaching learning process. Findings in table 3 clearly indicated that 75% of the learners agreed that assessment was being done on schedule and proper assessment records were also kept. They also agreed that curriculum content was adequately covered and all this was attributed to the fact that the administrative support gave them access to the required information. This was important that learners knew what was expected of them, the time when their assessment was expected and had confidence that curriculum coverage was adequate, which implies that the assessment contributed meaningfully to their learning outcomes (Jonassen, 2004). This approach is consistent with the need to emphasize assessment for the improvement of learning rather than mere grading of learners per say (Gunderman, 2006). It is therefore reasonable to assume that MLT as an institution offered adequate administrative support that encouraged assessment of and for meaningful learning.

Research question 4 investigated whether instructors followed appropriate curriculum assessment schedules in the

official curriculum document. Results from the investigations revealed that curriculum schedules were being strictly followed. This is reflected by the following verbatim explanations of respondents: the educators and clinical supervisors emphasized that the *time of assessment, curriculum content, and the nature of assessment were well known to them....* [furthermore] *We help learners to be ready for the several assessments because we know how they are arranged in the curriculum* (FGE).

Assessment guidelines of what to assess were also well described in the curriculum documents (FDE). *We know exactly when we are supposed to carry out the assessments, the section of the curriculum that needs to be assessed and the type of assessment that needs to be administered* (FGS).

The learners also concurred with their supervisors and educators concerning assessment schedules and curriculum content. A careful analysis of the documents at MLT indicated that written tests and experiments were being done regularly as a means of assessing progressive achievements of learners during their training. Reports of learners' practical projects and profiles were also found to be valuable in contributing to individual learner professional fulfillment. There were in addition record books for each class/cohort of students containing progressive performance of learners throughout the training program. This description of records found at the MLT does not only indicate that curriculum schedules were being followed but also confirms that a variety of assessment tools were used and adhered to in the assessment of the trainees. Learners (75 percent) also concurred that different assessment tools were used in their training program, this is consistent with existing literature (Downing & Yudkowsky, 2009).

Research question 5 - attempted to find out whether the assessment tools being used were reliable and valid?

Results of the study revealed that the assessment tools used were of high quality due to the fact that the process of constructing the assessment tools was rigorous. It went through an elaborate process which was preceded by seminars and workshops for examiners, conducted by experts in curriculum implementation and assessment management. The formative assessment was carried out by the internal examiners (i.e. educators and clinical supervisors) and was moderated by external examination bodies. These deliberate efforts helped all the stakeholders involved in the construction of the assessment tools to acquire the necessary competences (i.e. attitudes, skills and knowhow). These efforts further addressed the staff development challenge of some teachers who lacked the required skills of designing appropriate assessment tools for meaningful learning as described by (Jonassen, 2004) and demerits of self- and peer- assessment when compared to teacher designed assessment as discussed by numerous scholars (Norman E. Gronlund & Linn, 1990; Segers et al., 2003b; Topping, 2003). Therefore, it is reasonable to believe that the assessment tools prepared and used at MLT were reliable and valid and of high quality as reflected in table 3. In addition to rating done by the learners, a careful review of past papers from the question banks examined also showed that the tools fulfilled all criteria of a standard assessment instrument (Mugisha 2011). According to the author, the assessment strategies underpin the principles that shape learning outcomes/ objectives. The findings also revealed that the assessment tools were properly aligned to curriculum elements i.e. objectives, content and instructional strategies. This is reflected by the high grades exhibited in the external examination results.

Besides, educators and clinical supervisors agreed that all assessment tests done during classroom teaching also contributed to meaningful learning. This implies the possibility for a hidden curriculum operating especially in the practical teaching conducted by the clinical supervisors. However, this has mitigated the teaching / assessment technical deficiencies of the clinical supervisors in the design of assessment tools (Jonassen; 2004) and the possible negative effects of the hidden curriculum. This should have increased the validity of the internal assessment.

5. Conclusion

The assessment of learning in health sciences education is extremely vital. The findings of this study have revealed that learners were achieving the intended curriculum objectives progressively. This was possible because of the high quality assessment tools (in terms of reliability and validity) being used. The preparation of the assessment tools went through a rigorous process and careful attention focused on ensuring that basic concepts and principles of assessment were integrated during curriculum design and implementation in the MLT training program. This study results have also revealed that curriculum implementation was on the right course as evidenced by responses of the learners and their high grades during examinations. This good performance on examinations is a reflection of the contribution of the learner-centered assessment approaches being applied at the MLT. This was evident in the responses gathered from focus group discussions and interviews. Indeed, the institutional administrative support given to the teaching and learning processes also made a difference in ensuring that appropriate curriculum assessment schedules and strategies were strictly followed as stated in the curriculum structures. It is clear that a variety of assessment strategies were identified and integrated during curriculum implementation at the MLT and

these contributed meaningfully to enhance trainees' learning outcomes as well as preparing highly qualified competent contemporary healthcare professionals.

6. Recommendation

It is important to note that trends in health sciences education and practice are extremely dynamic. The knowledge and alertness of health trainers also need to be dynamic at a similar pace if not perhaps higher in both training and practice. Therefore, it is recommended that training institutions of healthcare professions should take authentic assessment of and for learning very seriously. Health trainers need to regularly get updated on trends in healthcare practice and health sciences education in general as well as on relevant assessment approaches in particular. Managers of the healthcare training institutions also need to regularly be sensitized about budgeting to cater for the continuous development of healthcare trainers.

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