

ADAPTIVE COMPETENCY BASED ASSESSMENT MODEL FOR PUBLIC UNIVERSITIES IN KENYA¹Eliud O. Oyoo*, ¹Rhoda Adoyo Odhiambo

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<https://orcid.org/0000-0001-7012-4752>; <https://orcid.org/0000-0001-7012-4752>¹Rongo University, P.O. Box 103-40404 Rongo, Kenya**Abstract**

Education systems are rapidly changing globally with time because of its dynamic nature. In spite of this, there has been perennial outcry by almost all stakeholders in Kenya on the need for a more reliable and yet valid assessment model for all levels in the schooling system. With the introduction of competency based curriculum in Kenyan primary schools, Junior schools, Senior Schools and lessons learnt during the 8:4:4 system period, there is need to align the assessment model at the public universities to the competency based education format as well as to the global best practices. This presents the need for a well-researched adaptive assessment model that will match the changing present time and at the same time win the confidence of all the stakeholders. In addition, assessment models should have a similar trajectory of the evolving education history and not lag behind the changing trend. Time is therefore ripe for a new assessment model which is realistic, workable and effective to be developed for use in Kenyan public universities. Objectives of the study were: To develop adaptive competency based assessment model for use in Kenyan Public Universities and to develop adaptive implementation methods for the assessment model in Kenyan public universities. The study was guided by constructivist theory. The research adopted analytical survey research design and mixed approach comprising literature document review, analysis and quantitative research methodology. It comprised of sub-models that will collectively be in line with Kenyan culture, implementation capacity and at the same time being well comparable with those in wealthy nations that tops in the global educational competency based assessment models. The research findings identified spaced model of assessment which includes: attainment of attendance threshold, computer adaptive tests, Practicals, projects and summative assessment with well spread mark load. In addition, the research finding show that majority (73%) of the relevant documents analyzed approved cumulatively an integrated and double model of assessment as the most realistic and effective model that can be applied in Kenyan public universities. The research finding further noted that the most suitable method of implementation is a collaborative approach involving all the relevant stakeholders, done at different times and then a cumulative score given finally as evidence of skills assessed. The findings are expected to fill the eminent gap brought about due to the time span, post COVID 19 era as well as the changing education system tailored towards employer-ability.

Key words: Adaptive, Assessment, Collaborative, Competency, Constructivist, Model.**Introduction**

Education is dynamic; consequently the assessment methods should keep the same rapid pace as the changing nature from one country to

the other. Onyeka (2020) noted that throughout history, academic assessment has been collaborative and evolving over time. Irrespective of the country, each public university should make a greater contribution to the cultivation of flexible

skills than focus only on static knowledge (Darra & Papanthymou, 2019) if this trend is to be matched with the desired graduating human personnel. The rapid change in the demand of the nature of work force calls for an equivalent pace in the assessment models that should be realistic and effective to the given target. Because of the massive penetration of computer and network applications in organizations in digitizing their processes and providing innovative products, services, and business models, the education market should wake up to these changes as well and the universities should be innovative in their assessment models (Rodríguez-Abitia, & Bribiesca-Correa, 2021).

The public release of generative artificial intelligence (GAI) tools (e.g., ChatGPT) has had a disruptive effect on the assessment practices of higher education institutions (HEIs) worldwide. Concerns have largely been associated with academic integrity, cheating and plagiarism. HEIs have had to develop guidelines in response to GAI. As many of these guidelines were developed in haste and could affect a large number of instructors and students, there is a need to examine their content, coverage and suitability. The findings show that just under half of the institutions have developed publicly available guidelines. The guidelines cover three main areas: academic integrity, advice on assessment design and communicating with students. Amongst the suggestions for teachers on assessment design, two appear particularly pertinent in helping develop effective assessment tasks and developing learners' AI literacy: first, running assessment tasks through GAI to check the extent to which the tool can accomplish the task and, second, having students use GAI as part of the assessment process. Overall, the review suggests that HEIs have come to accept the use of GAI and drafted assessment guidelines to advise instructors on its use. It may be beneficial to embrace GAI as a part of the assessment process since this is the reality of today's educational and job landscape. This will require instructors at higher learning institutions to develop a new competence - generative artificial

intelligence assessment literacy - which is conceptualised as computer adaptive tests (CAT) at the university level (Moorhouse & Wan, 2023) to complement the traditional assessment models.

To help public universities produce graduates that are competent in the eyes of the employers (Fan, 2022), there was need to identify the core competencies that goes with it. At the moment, there is a lot of Specific Learning Disabilities (SLD) that are often cited by employers which cannot be ignored and these should be addressed at the university levels by the key stakeholders (Griffith, Hirsch & Burns, 2022). This state of unpreparedness was revealed during the COVID 19 pandemic period, where many concerns and weaknesses on the reliability and validity issues on the Kenyan assessment tools for public universities were made bare. With the introduction of competency based curriculum in primary schools, Junior schools, Senior schools and lessons learnt during COVID 19 pandemic period as well as in the 8:4:4 assessment system, there is a huge gap on a dependable assessment model to align with the competency based education at public university level. There is therefore need to have a re-look at the most appropriate model that will match the inevitable change in the education systems at public universities and in the post COVID 19 era.

The study was guided by the following two objectives:

1. To develop realistic and effective competency based assessment model for use in Kenyan Public Universities.
2. To develop realistic and effective implementation method for competency based assessment model in Kenyan Public Universities.

For efficient focus of the research study, the following two questions were to be answered:

1. Which competency based assessment model is realistic and effective for use in Kenyan Public Universities?
2. Which implementation method is realistic and effective for competency based

assessment in Kenyan Public Universities?

The study was guided by constructivist theory, which originated from Jean Piaget (1947) and was further expounded by Papert (1980). On this basis, competency-based assessment is guided by a theoretical framework that emphasizes the evaluation of an individual's skills, knowledge, and abilities in real-world contexts. Constructivist theory, posits that individuals actively construct their understanding of the world based on their experiences and interactions. In the context of competency-based assessment at university, this theory will guide to make learning most effective by letting it occur within authentic situations and giving meaningful tasks.

Being cognizant that European and American universities are increasingly adopting competency-based learning, yet, there are different and conflicting definitions of competence, competency, and competency-based learning; Consequently, multiple interpretations and understandings are held by educators in respect of what these terms mean, when applied to their own teaching and assessment practices. Therefore, the theory will inform and guide discussions taking place amongst staff about their individual understandings and interpretations to make this approach clear in their context (Holmes, Tuin., & Turner, 2021). To improve the quality of peer assessment in PBL and to further promote learning by using the feedback of peer assessment, this study involved an integration of online progressive peer assessment (OPPA)-based PBL approach using constructivism as the theoretical framework for instructional design. (Wang, Hwang & Hu, 2023).

Many universities in Kenya are in the early stages of a learning revolution. New learning pathways have been forged by intense competition from organizations whose sole purpose is to deliver learning (anytime and anywhere) and by rapid advances in information technology. Forged by expediency, these paths no longer lead automatically to institutions of higher education. Instead they lead most directly to learning

opportunities that are intensely focused and are populated by learners and employers who are chiefly interested in the shortest route to results. In this paradigm, learning products are defined explicitly, delivery options are multiple, and a level of granularity not captured by traditional student transcripts (which display only credit hours and course titles) drives assessment. Most post-secondary institutions have been slow to accept these emerging realities, preferring instead to continue to package curricula in the standard lengths of the academic term and in traditional delivery formats. The bridge between the traditional paradigm, which depends on traditional credit hour measures of student achievement, and the learning revolution can be found in competency-based approaches (Voorheese, 2001).

The focus is the learner-centred educational design and the importance of fostering a growth mindset in learners, teachers, and educational programs. Besides, instructional practices and features of learning environments should foster the skills and strategies necessary for trainees to be partners in their own learning and progression to competence and to develop skills for lifelong learning (Acikgoz & Babadogan, 2021). In addition, many research findings reveal the necessity of technology to embrace new learning strategies that mimic real-world problems (Ghoniem & Ghoniem, 2022) and this is the essence of competency based assessment in all higher learning institutions.

Research Methodology

Analytical survey of document analysis research design was used. This was guided by clear and hybrid ordered steps of Abyaa et al. (2019) and Kitchenham et al. (2009) which were listed as follows:

1. Identification of the need for a literature review
2. Identification of the research questions
3. Identification of research databases

4. Assigning inclusion and exclusion criteria as well as the article gathering process
5. Evaluation of the selected studies
6. Data extraction clarification from each study
7. Classification of data exported from the selected studies
8. Extraction and interpretation of the results.

Following the recommendation of Katsaris and Vidakis (2021), the study explored the foundation for further research of competency based assessment model, which embedded various milestones to provide both personalized as well as collaborative assessment processes for the users. This blended the findings well in the evolving body of knowledge.

The research process synchronized the Rongo University library Myloft selected data bases which included: Scopus, Core, Grammarly, Mendeley, QuillBot, Publons, Lens.org, Dimensions, Google Scholar, Eric, Taylor and Francis eBooks. Time frame was majorly between 2018 and 2024, though there are a few excerpts that date earlier than that. The focus was to discover new trends in competency based assessment to inform the choice of a realistic and effective model for public universities (Holmes, Polman, & Turner, 2021).

The criteria for Inclusion used were as follows:

1. Only documents that focused on competency based assessments were used;
2. Only theoretical and empirical documents on competency based assessment were used.
3. Only observations and empirical documents on a recommendation on competency based assessment were used.

The exclusion criteria used were as follows:

1. All the documents that were not written in English
2. All the documents to which there was no full access
3. All the documents that had no competency based assessment format

4. All the documents that lacked detailed explanation and evaluation of the topic

In line with Katsaris and Vidakis (2021) format, gathering of 521 research articles and publications were done. This was followed by removal of duplicated articles, articles that were not accessible through the web and the articles that were not able to download. This left 416 articles. The third stage involved analysis of titles of the articles written in English which then left only the most suitable for this review, which were 196. In the fourth stage, the abstracts of the selected articles were studied, and publications that were not in the research domain of this review were removed, resulting in 108 articles. Finally, there was left 67 articles which were studied in details.

Following Glaser (1997) recommendation that academic assessment model should be collaborative and evolving over time but should involve careful planning, designing, implementation and refinement, the following procedure was outlined and followed:

1. Clearly articulating the purpose of the assessment model
2. Appropriate method chosen and aligned with the objectives of the assessment
3. Outlining the learning outcomes to be assessed
4. Creating assessment tasks that align with the learning outcomes to be assessed
5. Piloting to make the tools valid and reliable
6. Providing feedback mechanism from all the relevant stakeholders
7. Further refining the model collaboratively
8. Mirroring best world practices in assessment

The milestones for assessment to be used at university level were adopted from the global best practices of competency based assessment and these included various aspects of formative assessments which includes attendance of lecture sessions, book work, hands on activities or practicals, computer adaptive tests, projects and summative assessment (Zubler et al., 2022). The

mark load per milestone were arrived at based on the views of 67 randomly sampled stakeholders of public universities in Kenya. The Key stakeholders involved were lecturers, students and quality assurance officers.

Ethical considerations observed were: respect for intellectual property where all sources of information were cited. Data integrity and accuracy was observed where misrepresentation of the content documents were avoided and interpretation of documents were done objectively and transparently. Personal biases were avoided during interpretation of the data.

Results and Discussion

The research finding found that several assessment tools are documented for use, which can be formal or informal depending on the unit context and mode of assessment. McLoughlin (2008) particularly classified the competency based assessment tools as formal and informal. The recommended formal assessment tools are further categorized as norm referenced tests and standardized tests. These can be reported in percentile ranks, standard scores, normal curve equivalent, stanine and intelligent quotient depending on an individual university format of reporting. The informal assessments that can be used include interviews, curriculum based measurement, check lists, rating scales, questionnaires and portfolio assessments depending on the specific task to be assessed.

A water tight system was established in line with Dew (2018) design which was as follows:

1. Tools of write up assessments
2. Tools that simulated basic skills of assessments
3. Writing lessons
4. Hands on activities desired by employers.

Revised Bloom's (1968) hierarchy of cognitive facets should be taken into account. This combined with the principle of table of specification leads to the appropriate classifications of learners based on cognitive and

skill abilities.

The findings adopted a trend of embracing a collaborative approach. This involves an assessor working with a learner to collect evidence of competence, using the benchmarks provided by the unit standards that comprise the national qualifications. During a semester, a learner will be required to undertake a series of tasks for assessment purposes such as assignments, projects, tests and hands on activities work. It is the cumulative of all these assessments that are analyzed to consider a learner to be competent (or not). The unit of progression in a competency based training system, should be both mastery of knowledge and skills. The guiding principles according to Brouse (2020), was observed as follows:

1. The assessment process to be part of the learning process identifying gaps as learning opportunities to develop skills, not failures.
2. Collaborative process to be negotiated with the learner and not a one-off event that is imposed.
3. In the setting of a training provider, learners to be given many opportunities to demonstrate skill and the assessment process should allow for the capturing and recording of these demonstrations.
4. Flexible on mode of assessment and time of assessment.

In accordance with Wright (2005), the assessment should focus on identifying employer desired competencies. The assessment should involve clear verification approaches that are guided by reflective practices, outcome measurements of daily work and verification that develops critical thinking. With this in mind, the focus should be on the employability skills or competencies and not just grades.

In line with Wright (2015) recommendation and the analyzed views of the respondents, a model design which is continuous and the learner given many opportunities as possible was established. In

every opportunity given to the learner, performance recording criteria should be

provided for. Table 1 is a sample design of teachers score card matrix.

Table 1

Score Card Matrix for Teachers

Topics	Attendance (5 Marks)	Book work (15 Marks)	Practicals (15 Marks)	Computer Adaptive Tests (15 marks)	Projects (20 Marks)	Summative (30 Marks)	Total (100)
Topic 1							
Topic 2							
Topic 3							
Topic 4							
Topic 5							
Topic 6							

It should be noted that the awarding of marks is not fixed and can be adjusted depending on the nature of the topic and time span for teaching the topic as is prescribed in the course outline. Flexibility can also be considered based on each

university's constraints and affordability.

Table 2, is an example of score card for learners which takes into account the learners' perspective of the assessment process.

Table 2

Score Card for Learners

Classification	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6
Milestone	Date achieved	Date achieved	Date achieved	Date achieved	Date achieved	Date achieved
Attendance						
Book work						
Practicals						
Computer Adaptive Tests						
Project work						
Summative						
Completion						

Further and in line with Wright (2015) and the views of the respondents, the lecturer should be signing the learner's score sheet whenever a given milestone is satisfactorily learnt or attained, though it is the duty of the learner to notify the teacher.

The findings were further aligned to the recommendation by KICD (2023) that the country needed an assessment model that would embrace the differences in ability and learning styles of the recipients and ultimately enable each learners to realize success and fulfillment within their individual capacities.

Competency-Based Education (CBE) programs have developed differently within higher

education and medical education systems, yet both systems face challenges when bridging the gap between theory and practice. Both medicine and higher education face the challenge of adapting CBE programs for learners who begin the program with different configurations of knowledge and skills and learn at different rates. Additional challenges include, but are not limited to standard setting, time variability within programs for student learning, defining competencies, and training faculty to develop and assess CBE programs. (Smanski et al., 2022).

The university can develop in their websites assessment tools that can then be used where each stage of the assessment should be considered important and given a commensurate weighting.

The weightings are then summed up to give each student the final score and grade. The weighting matrix can be adjusted by specific universities as flexibility is the nature of this model.

Research findings from the studied documents further noted that different authors recommended different models, but when the ratings of their preferences were analyzed, the results are as presented in table 3.

Table 3

Analyzed Assessment Model Preference

Model type	Frequency	Percentage
Single Model	5	7
Double Model	13	20
Integrated Model	49	73
Total	67	100

The findings in table 3 show that majority (73%) of the authors preferred an integrated model as being realistic and effective. The findings are in line with Coon (2005), recommendations that a variety of learning outcomes requires different assessment approaches.

Both Clotilda (2021) and Gentry (2022), agree on the following as features of a good CBA tool or system:

1. Moving to a knowledge-based economy in education and training
2. Emphasis is on employable skills or competency - becoming progressively more crucial in training enhancement.
3. Acquisition of new and relevant life-long skills
4. As the economy moves up the value chain, workers or learners are expected to continually acquire new skills and knowledge to remain employable.
5. Human capital becomes the key competitive advantage in a knowledge-based economy.
6. Flexibility for change due to globalization and technology, workers or learners must be highly agile and be able to quickly

acquire and apply new skills, knowledge and technologies to continuously create new value, product and services.

7. Systematic way of collecting information and documenting what the learner knows and can do before they learn, as they learn and as they transit from one level to another based on specified competencies and criteria.
8. Uses a wider variety of tools and gives opportunities to learners, peers, teachers and parents to track the progress of the learner through real time feedback mechanisms.
9. Collaborative – between the stakeholders and this gives a reliable structure and consistency
10. The integrated CBA model approach improves pedagogy of educators and in the development of standardized assessment tools

Research findings from the studied documents further noted that different authors recommend different formats of implementing the assessment model. When the ratings of their preferences were analyzed, the results are as presented in table 4.

Table 4

Analyzed Preferred Implementation Format

Category	Frequency	Percentage
Lecturers Only	10	14.9
Students Only	6	10.0
Lecturers & Students	24	35.8
All Stakeholders	27	40.3
Total	67	100

Table 4 shows that majority of the documents analyzed had a preference for implementation format where all stakeholders are involved. The key stakeholders with major roles in the implementation model are lecturers and learners, while the other stakeholders like employers are equally important but play minor roles in the

process. The lecturers as a collaborative assessor is very key among all the stakeholders because of the skilled professionalism that they have. Where this may not be preferred then the second most popular option of involving teachers and students (35.8%) can be adopted.

The major limitation of CBA is the time constraints and the implementation challenges like large student populations against a small number of academic staffs. In addition, the problems in the current artificial intelligence curriculum, resources availability were identified and how they are likely to pause implementation challenges (Huang, 2021).

Conclusion and Recommendations

The research finding show that majority (73%) of the relevant documents analyzed endorsed an integrated model of competency based assessment as the most realistic and effective model that can be applied in public universities. The research finding further noted that the most suitable method of implementation is a collaborative approach, done by all stakeholders (40.3%) at different times and playing different roles in the assessment model. The cumulative score given finally acts as valid and reliable evidence of skills assessed. For all these to be realized, allocation of adequate funds and necessary resources will need to be mandatory for the university councils.

It is recommended that the university council members should adopt the competency based assessment model in order to get proficient graduates.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

The author(s), while preparing this work, utilized Google Scholar platform for literature review and referencing. After using this AI tool, the author(s) carefully reviewed and edited the content as necessary and assume(s) full responsibility for the publication's content.

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CRediT authorship contribution statement

Oyoo: Writing – review & editing, Writing – original draft, Methodology, Data curation. Odhiambo: Writing – review & editing, Conceptualization.

Declaration of Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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