3 Effects of Instructional Design Processes on the Quality of Implementing Electrical Installation CBET System in Kenya

Mr. Calvins Were Miseda & Prof. Kitainge, K. M.
University of Eldoret, Eldoret, Kenya

Abstract

Instructional design is a strategy for effective training of learners. Competence-based education and training (CBET) is a practical approach to education which emphasizes learners need to gain necessary knowledge, skills and attitudes to work successfully in their trade areas. It is regarded as an all-inclusive approach to education and it takes a complete paradigm shift from the conventional approaches. This study aimed at evaluating the impacts of instructional design processes on the quality of implementation of an Electrical Installation (EI) CBET system. The study employed positivism and interpretivism research philosophies. It adopted mixed method research design where both quantitative and qualitative data were collected and analyzed. A total of three TVET institutions and thirty-eight (38) trainers were selected using purposive sampling to be included in the sample frame. Data were collected using questionnaires and Online Focused Group Discussions (OFGD) and analyzed using descriptive statistics and content analysis. The major findings indicated that poor implementation of instructional design processes lead to low quality of electrical installation CBET system in Kenya. These inconsistencies on instructional contents, methodologies and assessments resulted in implementational gaps between CBET policy framework and implementational strategies. Additionally, EI CBET curricula weren't based on comprehensive analysis of what was required at the workplace environment. The paper suggested a holistic and logical reorganization of the units of competency into modules with inclusion of left out units of competencies and revision of TVET academic calendar with clearly spelt out industrial attachment periods. It also suggested in-service courses, pre-service training and capacity building workshops for trainers to enhance their degree of competences.

Keywords: Instructional design processes, quality implementation, CBET

Introduction

Background to the Study

Quality and relevance as outlined by Ferej et al (2012), are critical component of education and training globally. Industry players have constantly questioned the quality of trainees that graduate from TVET institutions in Kenya (RoK, 2018). In an effort to enhance this aspect of education and training, many countries have incorporated CBET system as an approach to preparing more competent trainees to more readily fit in the workplace environment. In Kenya, the government proposed reforms to the education sector and training through Sessional Paper No. 4 of 2016 to address the inadequacy of

relevant skills among graduates. The sessional paper embraced a paradigm shift to CBET approach in the educational sector.

CBET is a practical approach to training which emphasizes the need for learners to acquire necessary knowledge, skills and attitudes to work successfully in their field. Conversely, competence is the ability of a trainee to be able to perform up to the required standards of a workplace. It was thus informed by the need to bridge the skills gap that forced industries to re-train graduates on the job environment. Its thus worthwhile to come up with a study in CBET that judges its worth and quality, while its development is still in the implementational stage cycle.

Instructional design is a systematic process based on instructional theories of developing the curriculum content, instructional methods and specifications to promote quality training (CDACC, 2018). It deals with training activities which should assist trainees to gain relevant technical skills and industrial expertise. The aim of instructional design is to make the training process to occur. According to RoK (2018), instructional design ought to investigate what is to be taught, determine how it should be trained and assess the learning outcomes It's incumbent upon the Sector Skills Advisory Committees (SSACs) to develop an instructional design that offers a quality CBET. A good instructional design models as highlighted by CDACC (2018) should be able to analyze, identify potential problems early in the development stages and maintain focus on pedagogical qualities at every phase of its development. It's against this backdrop that this paper adopted a Context, Input, Process and Product (CIPP) model evaluation framework to investigate the quality the instructional design processes.

Justification of the Study

CBET being a fairly new approach of training in Kenya, it was important to evaluate instructional design processes on its quality. This would facilitate the re-designing, development and assessment of its instructional contents being anchored on sound studies and research. The study thus monitored how well the instructional goals and objectives were being met and pointed out deficiencies to necessitate appropriate intervention measures.

Objectives of the Study

The main of objective of this paper was to analyze the effects of instructional design processes on the quality of implementing of EI CBET system in Kenya. This main objective was guided by the following specific objectives:

(i) To analyze the quality of instructional content
(ii) To analyze the quality of instructional methods
(iii) To analyze the quality of assessment processes

Literature Review

Instructional Content

Curriculum is an instrument used by a nation to empower its people with the needed knowledge, skills and attitudes with an aim of achieving individual development (UNEVOC, 2015). Therefore, curricula must meet the requirements of both an individual and a nation at large. The goal of instructional designs is to demonstrate planning, developing, evaluating and managing the instructional process. Electrical Installation instructional design therefore consists of competencies that a candidate must achieve to enable them be certified as electrical technician. The work demands the technician to read and interpret electrical designs so that they install systems according to the national and international standards (CDACC, 2018). Additionally, the size and quantity of all materials, cables, control equipment and accessories and specifications of items necessary for installation of electrical systems largely determine the instructional contents.

In CBET, Occupational Standards (OS) specify competencies that a person has to acquire in order to obtain national TVET qualifications to work within a particular industry sector or occupation (RoK, 2016). They describe realistic workplace outcomes and are developed through a consultative process that includes key stakeholders under SSACs. UNEVOC (2015) noted that when curriculum designers are engaged as pedagogical experts instead of content experts and the teachers as content experts instead of pedagogical experts then the result is a divergence of content and pedagogy. Hence, connections between content and pedagogical domains should not be over looked in the preparation of occupational standard. The units of competency in Electrical Installation OS are divided into three categories namely the basic, common and core units of competency.

The basic units of competency at level 4 (Artisan), 5 (Craft) and 6 (Diploma) are all similar and include Communication Skills, Digital Literacy, Entrepreneurial Skills, Employability Skills, Environmental Literacy and Occupational Safety and Health Practices. The common units of competency at level 4 include Engineering Mathematics, Electrical Principles and Workshop Processes while level 5 and 6 has an additional Technical Drawing.

The core units of competency at level 4 include Electrical Installation, Testing of Electrical Installation and Electrical Installation Breakdown and Maintenance. At level 5 they include Plan Electrical Installation work, Electrical Installation, Testing of Electrical Installation, Maintain Electrical System and Electrical System Breakdown Maintenance. At level 6 they include Electrical Installation, Install Electrical Power Lines, Install Electrical Machine, Automate Electrical Machine, Install Security System. Others are Install Solar System, Maintain Electrical Equipment and Systems, Manage Electrical Project, Electronics and Power Generation.

Solomon (2016) highlighted that in the instructional design process, there are a lot of factors that should be taken into account. These factors are meticulously interlinked and affect each other to some degree. The study organizes these into instructional design steps. For instance, if the contents of units at level 4 are not chosen appropriately, then the units at level 5 or 6 will experience some deficiencies. Its critical to procedurally develop the contents of units in a logical manner and coherent to other preceding and succeeding units. Thus, instructional design is a major factor in designing of curricula. Every content of the units plays an important role in the education process. The curriculum developers should fully understand the interrelationships amongst the units (Solomon, 2016).

Instructional Methods

Instructional methods are the processes of translating general principles of training into plans of classroom interactions i.e., instructional materials and training activities (CDACC, 2018). For any new curriculum, its awareness and understanding depends on the training provided to trainers in order to enlighten them about the new curriculum. CBET trainers need to be knowledgeable of the processes of selecting suitable training methods that matches CBET contents and skills. The adopted instructional approaches should foster acquisition of cognitive skills, work behavior and psychomotor skills. Trainer must endeavor to use the learner-centered training methods since CBET is individual centered. Deibinger and Hellwig (2011) contended that prior to implementation of CBET, the teachers' knowledge and competence on a given trade should be evaluated. They needed to be passionate about the approach and comfortably apply the principles of its implementation.

Although both teacher-centered and learner-centered methods can be used, emphasis should be on learner-centered approaches as articulated by CBET guidelines. Thus, trainers must be competent on learner-centered methods. Some of the learner-centered approaches reinforced by CBET include demonstrations, observations, workplace training, case studies, performance and individual paced (CDACC, 2018). Extensively, CBET trainees need multiple alternatives of training methods in a setting that matches content levels and suitable learning theories.

Instructional Assessment

Assessment is a procedure of gathering evidence of candidates' performance upon which verifiers judge the extent to which trainees have met the performance criterion and training outcomes as laid out in the OS (RoK, 2016). It plays a key role in education since instructors can get information on whether the learners have attained the learning outcomes. CBET assessment is carried out on demand basis by the trainees and under conditions which should be as similar as possible to real workplace environment. It entails diagnostic, formative and summative assessment. It similarly involves assessment of prior learning to trainees embarking on the training process.

Diagnostic assessment is used to discover a trainee's strengths and weaknesses and identify training programmes for them. Formative assessment takes place throughout the training program and trainees are assessed and given feedback as they undergo training process. It checks on the trainee's progress and provides feedback on areas that need more learning. Summative assessment is conducted at predetermined points in the training process and is cconducted by registered external.

The trainers should be conversant with assessment activities i.e., planning, pre-assessment, assessment and post-assessment activities. The quality of an assessment process is important as it enhances the achievement of employability skills. CBET assessments must be in line with the training outcomes and thus shouldn't be group based which compares and ranks candidates.

Methodology

The study was guided by positivism research philosophy. The philosophical choice was guided by the type of knowledge being investigated in the study. Positivism views that only factual knowledge gained through scientific process is trustworthy and researchers' role is only confined to data collection and interpretation. Since the researcher is a specialist in the TVET sector, his objective interpretation of the responses formed the backbone of the study. The study employed a mixed method design in which both qualitative and quantitative data were collected and analyzed.

Thirty-eight (38) trainers were selected using purposive sampling and included in the sample frame. Data were collected using questionnaires and online focused group discussions (OFGD). Qualitative data were analyzed using content analysis which emphasized on thematic contents while quantitative data were analyzed using descriptive statistics.

Findings

Quality of Instructional Contents

The quality of instructional content was gaged based on the basic, common and core units of competencies.

Table 1

Basic Units of Competencies

S/No	Basic Units of Competency	SA	%	A	%	D	%	SD	%
1	Communication Skills	6	15.8	8	21.1	11	29.0	13	34.2
2	Entrepreneurial Skills	3	7.9	9	23.7	14	36.8	12	31.6
3	Employability Skills	7	18.4	6	15.8	9	23.7	16	42.1
4	Digital Literacy Skills	6	15.8	7	18.4	10	26.3	15	39.5
5	Environmental Literacy	5	13.2	4	10.5	11	29.0	18	47.4
6	Occupational Safety and Health Practices	6	15.8	7	18.4	14	36.8	11	29.0

Note: SA: Strongly agree; A: Agree; D: Disagree; SD: Strongly disagree

Items 1 to 6, tested whether curriculum contents of basic units of competency build on each other in a logical order from level 4 through 5 to 6. From the trend in Table 1, higher percentages of respondents disagreed and strongly disagreed that contents of basic units of competency built on each other in a coherent order from level 4 through 5 to 6. Environmental literacy had the highest number of responses at 47.4% strongly disagreeing and 29% disagreeing.

OFGD further showed that contents of the basic units of competency were actually replica of each other across the three levels. This was also reported in most of the common and core units of competency. Additionally, it revealed that there was lack of Technical Drawing, Solar Systems, Electronics and Estimations and tendering at level 4. Level 5 lacked Solar Systems, Electronic and Estimation and Tendering. Level 6 lacked Estimation and Tendering. These units are integral at any level in Electrical Installation syllabus.

These results pointed out inadequate quality in the instructional content. The shortages inhibited systematic training and quality acquisition of skills in EI. The skills critical in trade areas should be included in curriculum content based on proper goal analysis and content selections. A replica in the contents and lack of essential units demonstrated that the training objectives weren't identified properly. Muneja (2013) noted that skills associated with content design should include identifying and sequencing enabling objectives, selecting optimal testing points and preparing instructional materials. Since progression pathways is provided from level 4 up to 6, the contents of units must similarly be as such.

Quality of Instructional Methods

The quality of instructional methods was assessed based on the CBET instructional methods and the capacity of the trainers to delivery a CBET programme.

Table 2

CBET Instructional Methods

No	CBET Instructional Methods	SA	%	A	%	D	%	SD	%
1	Demonstration of competence than content based	6	15.8	7	18.4	11	28.9	14	36.8
2	Prioritizes performance than time based	7	18.4	8	21.1	10	26.3	13	34.2
3	Individual paced than group paced	4	10.5	6	15.8	12	31.6	16	42.1
4	Stresses individual needs than group needs	6	15.8	5	13.2	15	39.5	12	31.6
5	Immediate feedback than delayed feedback	7	18.4	9	23.7	11	28.9	11	28.9
6	Learning in workplace environments than classroom	8	21.1	10	26.3	11	28.9	9	23.7
7	Uses demonstrations than lectures	7	18.4	6	15.6	12	31.6	13	34.2
8	Is criterion refenced instead of norm refenced	4	10.5	9	23.7	14	36.8	11	28.9
9	Stresses competence than final grades	11	28.9	7	18.4	13	34.2	7	18.4
10	Should the units be restructured into modules	18	47.4	14	36.8	4	10.5	2	5.3

Items 1 to 10 evaluated the quality instructional methods. From the trend in Table 2, higher percentages of trainers disagreed and strongly disagreed that they were using the set instructional methodologies. Individual paced rather than group paced had the highest response with 42.1% strongly disagreeing and 32.6% disagreeing. On whether the units of competencies be organized into modules, majority at 47.4% strongly agreed followed by 36.8% that agreed.

OFGD results further pointed out that most trainers used the conventional approach to training on the CBET students. Most respondents reported that they taught the CBET classes just like the other classes, with one teaching and exam timetable for both groups. This was necessitated by the fact that they shared resources i.e., workshops and trainers between conventional and CBET classes. The respondents further noted that the units of competencies needed to be reorganized into modules with industrial attachments intervals properly spelled out. The units forming a particular module needed to be systematic from simple to complex i.e., at level 4, Electrical Installation be covered first then Testing of Electrical Installation and finally Electrical Installation Breakdown and Maintenance since the units build on each other.

These findings annulled the CBET standard guidelines set out by CDACC (2018) which highlighted that instructors needed to use different training methods, rules and principles in order to achieve an effective CBET approach. They showed that the training activities were not focused on skills acquisition and were never presented under the best conditions of CBET system. Planning activities of trainers between CBET and conventional approaches had significant impacts on quality CBET. There also appeared to be an emerging tension between learner-oriented and content-oriented instructional design in learner-centered instruction. Thus, in order to select the most appropriate instructional methods, instructional designers needed thorough knowledge of connecting contents and methods.

Table 3

Trainers Capacity on the Quality of Instructional Methods

No	Trainers Competence on the Quality of Instructional Methods	SA	%	A	%	D	%	SD	%
1	Trainers underwent seminar to equip them with necessary knowledge of implementing CBET	30	78.9	5	13.2	1	2.6	2	5.3
2	The seminars prepared trainers with the requisite knowledge of implementation	8	21.1	6	15.8	11	28.9	13	34.2
3	The trainers are well conversant with the CBET implementation strategies	6	15.8	5	13.2	13	34.2	14	36.6
4	The trainers' years of experience have perfected their skills in implementation of CBET	15	39.5	13	34.2	7	18.4	3	7.9
5	Department has adequate trainers to implement CBET curriculum	8	21.1	5	13.1	16	42.1	9	23.7
6	Trainers have capacity to repair CBET training equipment and tools	5	13.1	7	18.4	11	28.9	15	39.5
7	Trainers have capacity to keep proper records of training processes	6	15.8	8	21.1	10	26.3	14	36.8

Items 1 to 7 evaluated impacts of capacity and competency of trainers on the quality of classroom interaction. Trend in table 3 showed very varied responses. While most trainers at 78.9% strongly agreed that they underwent seminar to equip them with necessary knowledge on CBET, however, 34.2% strongly disagreed that these seminars impacted them with requisite knowledge in its implementation. Those who strongly disagreed that they were conversant with the CBET curriculum were 36.7% and strongly depended on their years of experiences in implementation. The trend further pointed out that trainers lacked capacity to repair training equipment. Likewise, they lacked capacity to prepare and keep training records.

The records included portfolio of evidence, appeals form, workplan, assessment records, assessment review forms, candidates' tool, assessors' tool and assessment plan. All these documents lacked clear template from CDACC and thus different institutions were developing their own prototypes leading to inconsistencies and inaccuracies in the training and assessment process. This therefore negated the CDACC (2018) guidelines which highlighted that assessment tools should have both reliability and validity attributes to accurately and consistently determine the learning outcomes. Apparently, the seminars never achieved their intended outcomes.

Remarkably, the main implementers of CBET approach were the trainers but there was still a big task in their capacity building. They needed to understand how to plan, develop, implement and successfully evaluate instructional activities to ensure quality instructional processes. This required coming with tailor made CBET instructional models. During the instructional design processes, models help instructors to visualize problems and find solutions.

Quality of Assessment Processes

This was determined based on the job assessment processes.

Table 4

On-the-job Assessment Processes

No	On-the-job Assessment Designs	SA	%	A	%	D	%	SD	%
1	Uses supervisors report to access key competencies	5	13.2	7	18.4	12	31.6	14	36.9
2	Uses self-assessment by trainees to reinforce practical skills	13	34.2	11	28.9	8	21.1	6	15.8
3	Uses observation and record performances of tasks over a period of time	6	15.8	8	21.1	11	28.9	13	34.2
4	Uses work-based projects to access production of skills	6	15.8	7	18.4	9	23.7	16	42.1
5	Uses team-based projects to access practical skill	10	26.3	9	23.7	11	28.9	8	21.1

Items 1 to 5 evaluated the quality of on-the-job assessment processes. Data on Table 4 showed that self-assessment by trainees was mostly used with 34.2 % strongly agreeing and 28.9% agreeing. However, the data trend revealed that supervisors report, observation and work-based projects were rarely used in assessment. Data trend on team-based project had almost similar responses and couldn't give a clear conclusion. Focused group discussion further showed that self-assessment was mostly used in CBET since it wasn't a complex process.

These results showed that trainers didn't use different assessment methods and principles in order to make their assessment objective. The results never depicted CBET standard guidelines on assessment set by CDACC (2018) which emphasized that assessment process should give more focus on problem-based activities, assessment by designing and cognitive apprenticeship models. During assessment processes, trainers collects reliable data from candidates such as the acquisition of requisite skills and knowledge (Muneja, 2013). The assessment model adopted should thus give the depicted instructional outcomes as itemized in the contents. Hence, in order to develop effective assessment design, trainers needed to understand not only the curriculum content but also pedagogical strategies and learning theories.

Conclusion

The results showed that poor implementation of instructional design processes lead to low quality of electrical installation CBET system in Kenya. These inconsistencies on instructional contents, methodologies and assessments resulted in implementational gaps between CBET policy framework and implementational strategies. Additionally, EI CBET curricula weren't based on comprehensive analysis of what was required at the workplace environment.

Recommendations

The paper suggested a logical reorganization of the units into modules with clearly spelt out industrial attachment periods and TVET calendar of 3 terms in a year revised to conform to CBET approach. It also recommended inclusion of units such Technical drawing, Solar Systems, Electronics and Estimation and Tendering at appropriate levels. Since the competency of trainers are crucial in delivery and assessment of CBET curriculum, they should undergo refresher courses, in-service courses, pre-service training and capacity building workshops to enhance their high degree of skills.

References

Curriculum Development Assessment and Certification Council (2018). *Embracing Competency Based Education and Training (CBET) for Quality and Relevance in TVET Sector in Kenya*. Government Press: Nairobi.

Deibinger, T., & Hellwig, S. (2011). *Structures and functions of competency-based education and training (CBET): A comperative perspective,* Germany: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), BMZ, & Federal Ministry of Economic Cooperation and Development.

Ferej, A., Kitainge, K., & Ooko, Z. (2012). *Reform of TVET teacher education in Kenya: Overcoming the challenges of quality and relevance*. Triennale on Education and Training in Africa, 12-17.

Muneja, M. S. (2015). *Secondary school teachers' implementation of the competency-based curriculum in the Arusha Region, Tanzania*. University of South Africa

Republic of Kenya (2018). Competency Based Education and Training Policy Framework in Kenya. Government Press: Nairobi.

Republic of Kenya (2016). Session Paper No. 4 (2016). Policy framework for Reforming Education and Training in Kenya. Government Press: Nairobi

Solomon, G. H. (2016). *Towards Competence-based Technical-Vocational Education and Training in Ethiopia*. (Doctoral dissertation, Wageningen University).

UNEVOC (2015). Instructional Design and eLearning: A Discussion of Pedagogical Content Knowledge as a Missing Construct. IBE No. 15. Geneva. UNESCO