

**FORMATIVE USE OF AUTHENTIC ASSESSMENT IN
COMPETENCIES ACQUISITION AMONG UNDERGRADUATE
SCIENCE STUDENTS IN HIGHER EDUCATION
INSTITUTIONS IN TANZANIA**

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<https://doi.org/10.37602/IJREHC.2023.4416>

ABSTRACT

Formative use of authentic assessment is regarded as a key aspect of competence acquisition among undergraduate science students. The study employed a pragmatism research paradigm with the mixed-method research approach. The research design used was an explanatory sequential research design. The target population for the study was 650 third-year undergraduate science students from the two Higher Education Institutions. The sample for the study was 231 undergraduate science students who were selected by proportional stratified random sampling technique. In addition, six (6) instructors were selected by using purposive sampling based on their areas of specialization. Data analysis was done by using descriptive survey and thematic analysis for quantitative and qualitative research approaches respectively. The findings indicated that the formative use of authentic assessment in general and authentic assessment tools, in particular, was not well realized. Authentic assessment tools such as portfolios, projects, and practical work were not used on a formative basis. The concern was grading the achievement of learners through those tools rather than for the improvement of learning processes among them. However, teaching practice or fieldwork as one of the tools of authentic assessment was found to be used on a formative basis since the emphasis was the acquisition of competencies through the active engagement of students. Undergraduate science students were exposed to real-life situations accompanied by the provision of oral and written feedback for the sake of improvement. It is concluded that formative use of authentic assessment in general was not well realized leading to the persistence of criticism among education stakeholders on the inadequacy of competencies to the graduates. The study recommends the formulation of clear policies on the implementation of authentic assessment in Higher Education Institutions on a formative basis.

Keywords: Formative use, portfolios, practical work, higher education institutions, competencies

1.0 INTRODUCTION

Formative use of authentic assessment has been an area of concern by scholars worldwide towards quality education provision in Higher Education Institutions (HEIs) (Akbari et al., 2022; Ghosh et al., 2021; Gunasekara & Gerts, 2017; Karunanayaka & Naidu, 2021; Villarroel et al., 2018). Formative use of authentic assessment involves the use for the sake of

improvement of teaching and learning processes (Falchikov, 2005; Irons, 2008). It is the use that focuses on the enhancement of learning which in turn leads to the acquisition of competencies among undergraduate science students (Beka & Kulinxha, 2021; Farid, 2018; Mokhtaria, 2015). It is one of the participatory approaches in assessment that is considered a student-centred approach recommended for HEIs (Ellis et al., 2020; Zakiah & Fajriadi, 2020). It involves tasks such as projects, independent study, portfolios, fieldwork, and practical work. It is an area of concern for the provision of quality education by actively engaging students in performing different tasks as they learn hence the acquisition of competencies (Ghosh et al., 2021; Hortigüela Alcalá et al., 2019; Koh et al., 2019). The acquisition of competencies is well demonstrated through the formative use of authentic assessment (Firdausi & Supinah, 2021; Miller & Konstantinou, 2022; Nicol et al., 2019).

Since formative assessment and its use are considered to be student-centred; the use are likely help students to become competent due to active engagement in carrying out tasks. Formative uses of assessment tools has been widely documented, however, formative uses of authentic assessment in general and authentic assessment tools in particular has not well been documented.

Formative use of authentic assessment is of paramount in HEIs because actively engages students in performing tasks which in turn make them acquire competencies (Hernández, 2012; McCallum & Milner, 2021; Torres, 2019; Yüksel & Gündüz, 2017). Students are given tasks with rubrics which specify the tasks done by indicating activities and criteria for judgement of the tasks hence leading to enhancement of learning process (Gallardo, 2020; Ghosh et al., 2020). In addition, students are given written and oral feedback for improvement on areas of weaknesses (Kulasegaram & Rangachari, 2018; Kyaruzi et al., 2019). This process of feedback provision ensures quality education as students are equipped with the required competencies through active engagement in tasks. Likewise, since formative use of assessment does not involve grading, students become less anxious in the process of learning and carrying out tasks (Ellis et al., 2020; Irons, 2008). Authentic assessment is formative based type of assessment in that is regarded as assessment used to enhance learning among students. It is regarded as student-centred rather than instructor-centred form of assessment. It differs from traditional paper and pencil that focus on summative uses ending on grades. Formative use of authentic assessment should not involve grades (Falchikov, 2005; Irons, 2008) rather for improvement of the learning processes which in turn leads to competencies acquisition.

Several studies have indicated uses of authentic assessment on summative basis (Broadbent et al., 2018; Hilden et al., 2022; Houston & Thompson, 2017; Ishaq et al., 2020; Nyinge, 2022; Sewagegn & Diale, 2020). For instance, Hilden et al. (2022) insisted on the summative use of authentic assessment since instructor are confident in their uses. Likewise, Bloxham and Boyd (2007) comment that authentic assessment are used for the sake of grading and certification due to modularization system of higher education institutions. Similarly, Nyinge (2022) indicated some authentic assessment tools namely practical work, projects and portfolios to be used summatively. However, little is known on the formative use of authentic assessment in HEIs. Studies available focus on formative assessment in general (Asamoah et al., 2022; Kulasegaram & Rangachari, 2018; Kyaruzi et al., 2019; Leenknecht et al., 2021; McCallum & Milner, 2021; Mgimba, 2021; Xiao, 2017). However, even the available studies on formative assessment in HEIs base on the formative assessment in relation to learning rather than

formative use of authentic assessment (Mbalamula, 2018; McCallum & Milner, 2021; Nina & Botezatu, 2020).

Contrary to the purpose of formative use of authentic assessment, little is known since studies cited so far concentrate on the formative assessment in general. If formative use of authentic assessment is left unaddressed the quality of education in HEIs may be jeopardized hence affecting the acquisition of competencies among learners. The concern of this study was the opinions of students and instructors on the formative use of authentic assessment as is considered to lead to quality education through acquisition of competencies. The study intends to contribute knowledge on the formative uses of authentic assessment in the acquisition of competencies among undergraduate science students. The question for investigation is to what extent authentic assessment used on formative basis leading to competencies acquisition among undergraduate science students in HEIs?

1.2 Meaning of Authentic Assessment

Authentic assessment is conceptualised in different ways by different individuals. Gulikers et al. (2004, p. 69), for example, conceptualise an authentic assessment as “an assessment requiring students to use the same competencies, or combinations of knowledge, skills, and attitudes that they need to apply in the criterion situation in professional life”. Mueller (2005, p. 2), defines authentic assessment as “a form of assessment in which students are asked to perform real-world tasks that demonstrate meaningful application of essential knowledge and skills”. According to Swaffield (2011, p. 2), authentic assessment refers to “the assessment of learning that is conducted through ‘real world’ tasks requiring students to demonstrate their knowledge and skills in meaningful contexts”. Likewise, Anderson (2003, p. 72) defines authentic assessment as an assessment with tasks having some connection to real-life situations, practical problems, or both.

2.0 FORMATIVE USES OF AUTHENTIC ASSESSMENT TOOLS

Formative use of authentic assessment tools focuses on the improvement of the learning process through feedback provision which in turn enables undergraduate science teachers to acquire the competencies. In support of such an argument on improvement, Andersson and Palm (2018) comment that formative uses of authentic assessment improve learners’ academic achievement as it involves active engagement. Similarly, Xiao (2017) argues that formative use is one of the powerful strategies that enhance students learning. It is one of the uses which involve learners actively in constructing the competences as they are learning. Formative use of authentic assessment does not involve grading but rather the performance of tasks for the sake of improvement of the learning process through feedback provision (Torres, 2019). Though some scholars argue that it is time-consuming and that sometimes the undergraduate science teachers do not put more effort into doing the tasks given; it is likely to be more effective in the learning process. The effectiveness of formative use is based on the fact that undergraduate science teachers are less likely to be anxious while engaged in performing the given tasks hence positive learning leading to competences acquisition.

Furthermore, the formative use of authentic assessment enhances learning hence competence acquisition among undergraduate science teachers. Leenknecht et al. (2021) support the beneficial effects of formative uses of authentic assessment by indicating that it promotes

learning since is considered an integral part of teaching and learning. Similarly, Torres (2019) indicates that students acquire competencies through formative uses of authentic assessment through timely and constructive feedback provided. Since formative uses call for active engagement among learners in carrying out the tasks; enhancement in learning leading to competence acquisition is well evidenced. As they perform the tasks; feedback from the instructors and their peers helps them to find areas of strength and weaknesses to act on to improve the learning processes. That being the case, the use of authentic assessment tools plays a great role towards the acquisition of competences among learners as they are involved in the process of learning.

Undergraduate science students are in a position to monitor their learning progress through the various tools of authentic assessment used. Authentic assessment tools not only make it to be assessment for learning but also make it assessment as learning. For the competences acquisition to be realized by undergraduate science students, these authentic assessment tools should be used in such a way that they support learning (Hernández, 2012; Torres, 2019). However, learning is supported through feedback provided during the learning process hence helping them to work on areas of weaknesses and strengths (Andersson & Palm, 2017). Furthermore, such feedback might help them stay on task as they are working on the suggested areas. Similarly, Sewagegn and Diale (2020) indicate that formative uses of authentic assessment enhance students' learning in HEIs which in turn leads to the acquisition of competencies. Scholars cited have shown benefits on formative uses of authentic assessment in particular and assessment in general towards competences acquisition. However, little has been addressed on the formative use of authentic assessment tools for the enhancement of teaching professional competencies from a higher education perspective.

2.1 Conceptual Framework

This study is guided by the conceptual framework on authentic assessment that involves authentic assessment as independent variable and teaching professional competencies as dependent variables. The independent variable comprises of some selected authentic assessment tools which include portfolios, projects, teaching practice and practical work. These variables (independent and dependent) form the visual representation of a study's organization or major theoretical tenets (Ravitch & Riggan, 2012).

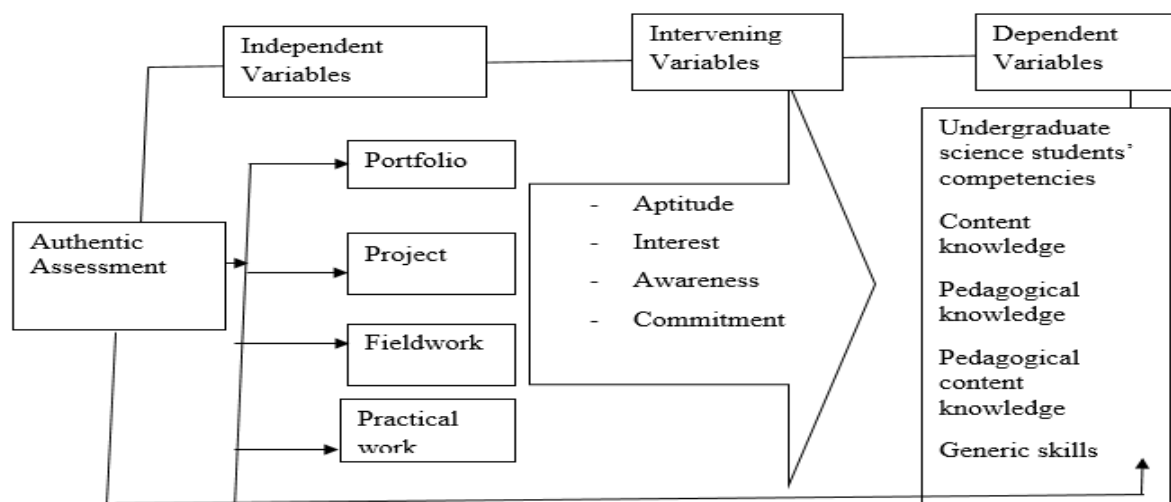


Figure 1.1: Conceptual Framework on Authentic Assessment constructed by Researcher

The conceptual framework indicates the relationship between variables which include independent and dependent variables. A variable may be defined as “a condition or characteristic that can take on different values or categories” (Johnson & Christensen, 2014). The arrows in the figure show the relationship between independent variable and dependent variables.

2.2 Independent Variables

Independent variables (IV) are the variables presumed to cause change to occur in other variables (Ary et al., 2010; Johnson & Christensen, 2014). In this study independent variable was authentic assessment which comprises of four authentic assessment tools namely portfolios, projects, teaching practice and practical work. These authentic assessment tools enhance acquisition of teaching professional competencies among the undergraduate science students which form dependent variables. The point of concern is how the uses of authentic assessment tools lead to the acquisition of competences among undergraduate science students as they are engaged in the tools adapted by instructors.

2.3 Dependent Variables

Dependent variable (DV) is the outcome variable or the variable presumed to be influenced by one or more independent variables (Ary et al., 2010; Johnson & Christensen, 2014). In this study dependent variable is the teaching professional competencies which comprises of types of competencies namely content, pedagogical, pedagogical content and generic skills. These are the competences presumed to be influenced by authentic assessment tools (IV). As undergraduate science students are exposed to the tools of authentic assessment, they are likely to acquire teaching professional competencies. However, there are intervening variables that may affect the relationship between independent variables and dependent variables.

Intervening variable or mediating variable is the one which occurs between independent variable and dependent variable in a causal chain (Johnson & Christensen, 2014). Such intervening variables include aptitude, attitude, interest, awareness, and commitment. In order for the authentic assessment (independent variable) to influence competence acquisition (dependent variable) among the undergraduate science students, the intervening variables will be kept constant. This was done by involving third year undergraduate science students who are believed to possess similar attributes in terms of aptitude, attitude, interest, awareness and commitment. These intervening variables were kept constant by involving the mentioned sample from similar learning environment believed to have common interest as all specialized in two science teaching subjects.

Since they are third year science students from the same institutions it is expected that they have the aptitude, attitude, commitment and interest that have made them last in the area of specialization of their choice. Also these are undergraduate science students specializing in two teaching subjects i.e. biology and chemistry meaning they have the same interest.

3.0 METHODOLOGICAL CONSIDERATIONS

3.1 research paradigm and Approach

The study employed pragmatism research paradigm that focuses on what works in order to answer the research question (Creswell & Plano Clark, 2011; Johnson & Christensen, 2014). Teddlie and Tashakkori (2009) describe pragmatism to comprise of two major characteristics i.e. the rejection of dogmatic either-or-choice between interpretivism and positivism and the search for practical answers to questions that intrigue the researcher. Since the study involved formative uses of authentic assessment; the point of concern was the way is used and how is used whether for the sake of improvement of teaching and learning processes or for grading. It was necessary therefore to use the paradigm that covers both what and how questions basing on what works.

Research approach used was mixed method because the concern was to gather quantitative data in terms of frequency on the formative use of each authentic assessment tool. Furthermore, qualitative data were gathered on the reasons for uses and how authentic assessment was used.

3.2 Research Design

The study employed the explanatory sequential design. This design involves first collecting quantitative data and then collecting qualitative data for the aim of elaborating quantitative results (Creswell, 2012; Creswell & Plano Clark, 2018). This means, quantitative data provided overall overview of the research problem by looking at the uses while qualitative data provided reasons or experiences on the formative use of authentic assessment tools. Creswell (2012) adds further that, in explanatory sequential design quantitative approach is given higher priority than qualitative approach. In this study quantitative approach dominated while qualitative research approach was given less emphasis as follow up to the quantitative findings.

3.3 Population and Sampling

The target population for the study was instructors and third year undergraduate science students specializing in biology and chemistry subjects from the two higher education institutions in Tanzania. The sample involved 231 third year undergraduate science students specializing in two teaching subjects namely chemistry and biology. The sample from the undergraduate science students was selected by using stratified random sampling as the concern was to get representativeness in terms of gender. In addition three (3) instructors and six (6) undergraduate science students who were purposeful selected were included in the study. The instructors were selected basing on the area of specialization namely chemistry, biology and education particularly curriculum and instruction. While the undergraduate science students were selected basing on the uniqueness of the responses from the questionnaire.

4.0 METHODS OF DATA COLLECTION

This study employed questionnaire and interviews as data collection methods.

4.1 Questionnaires

Questionnaire with close ended questions was used to collect data from undergraduate science students on the formative use authentic assessment. Questionnaire was used because is one of

the instruments which is flexible and might collect objective information on the purpose of using authentic assessment among the undergraduate science students (Johnson & Christensen, 2014; Lodico et al., 2010). Questionnaires, however, have the tendency of failing to probe detailed information on the reasons for the formative use of authentic assessment tools. It was important, therefore, to supplement data collection by using interviews.

4.2 Interviews

Semi-structured interview was used to collect data on the uses of authentic assessment to three (3) instructors and six (6) undergraduate science students. Interview was used in order to get detailed explanation on how authentic assessment tools were used in higher education institutions. However, interviews have some weaknesses such as time consuming, open to interviewer bias hence hard to achieve objectivity, and interviewee fatigue (Cohen et al., 2007; Denscombe, 2010). These weaknesses were addressed in this study by good planning it terms of time in that appointment was made earlier with respondents to avoid time wastage and taking so long for interview session.

5.0 FINDINGS

The findings of the study indicated formative use of authentic assessment tools namely portfolios, projects, practical work and teaching practice as presented below.

5.1 Formative use of Portfolio

Formative use of portfolios by instructors with regard to the competencies acquisition among the undergraduate science students involved seven areas of competencies as shown in the Table 5.1.

Table 5.1: Formative use of Portfolio (N = 231)

Item	SA	A	N	D	SD	Mean
Portfolios are used as tools to facilitate the teaching and learning processes by instructors	10(4.3)	13(5.6)	21(9.1)	114(49.4)	73(31.6)	2.02
Portfolios are used by instructors to help students develop content (subject matter) skills	5(2.2)	2(0.9)	13(5.6)	95(41.1)	116(50.2)	1.64
Portfolios are used by instructors to help students develop pedagogical skills	9(3.9)	15(6.5)	30(13)	103(44.6)	74(32)	2.06
Instructors use portfolios to help students design the schemes of work	7(3)	5(2.2)	13(5.6)	62(26.8)	144(62.3)	1.57
Instructors use portfolios to encourage students in designing the lesson plans	4(1.7)	14(6.1)	31(13.4)	100(43.3)	82(35.5)	1.95

Portfolios provide information to students aimed at finding the weaknesses and strengths in the learning process	8(3.5)	7(3)	23(10)	86(37.4)	106(46.1)	1.8
Instructors use portfolios to enhance team working spirit among students	6(2.6)	7(3)	28(12.1)	72(31.2)	118(51.1)	1.75
Overall						1.83

Key: Strongly Agree (SA) = (4.5 – 5.0), Agree (A) = (3.5 – 4.4), Neutral (N) = (2.5-3.4), Disagree (D) = (1.5 – 2.4), Strongly Disagree (SD) = (1.0 – 1.4)

Source: Field data (2021)

The findings from undergraduate science students indicate that under the formative use of portfolios there were seven competence areas. Results indicate that all seven competences fall under the level of disagree. In other words, the undergraduate science students indicated degree of disagreement on the use of portfolios formatively on all seven areas. However, in some of the competences there were high rate of disagreement on the formative uses of portfolios among the respondents. These include competence on the formative use of portfolios by instructors in helping students develop content (subject matter) skills. The findings indicated that 116 (50.2%) of the respondents strongly disagreed, and 95 (41.1%) disagreed as indicated in the Table 4.3. Another competence which had high rate of disagreement was on the uses of portfolios formatively to help students design scheme of work. The findings indicated that 144 (62.3%) of the respondents strongly disagreed, and 62 (26.8%) disagreed. The overall mean on the formative use of portfolios with regard to respondents’ opinion is 1.83 implying higher degree of disagreement on the use.

Likewise, the qualitative findings indicated formative use of portfolios though basing on responses provided appears to be similar to the quantitative findings which indicated portfolios not to be used formatively. For example through interview; one female instructor from institution ‘A’ insisted on the formative use of portfolios as follows:

Most activities like portfolios I can consider them formative; I consider formative because are done in the process of teaching and learning. For example, in courses such as CT 231 and CT 304 students are required to prepare portfolios as one of the requirements for the coursework.

Basing on the response from the instructor, formative use of portfolios was unlikely because grading was involved. Being done in the process of teaching and learning does not qualify it to be formative rather when used just for the sake of improving teaching and learning process. In addition, the response from the undergraduate science student from institution ‘A’ indicated portfolios not to be used formatively as she said:

.....portfolios are for both teaching and learning process and grading; after constructing portfolios instructors emphasize to present what has been designed then

submitted for marking. You know the emphasis is placed on the marks to be assigned by instructor after submission and we do concentrate more on achieving the highest grades.

The response from a student indicates formative use of portfolios, however, summative use was dominant because the end process was grading rather than improvement of learning process through feedback. The uses of portfolios, however, was reported in only few educational courses rather than in science courses where were not used at all. This may be evidenced from one of the students from institution ‘B’ who had this to say on formative use of portfolios:

.....the uses differ actually it depends on the tools; but portfolios so far we have not done any. In chemistry courses and biology courses since we joined first year at this university we have not done any activity related to portfolios.

This response justifies the quantitative findings with the highest rate of disagreement on the formative uses of portfolios in that in some courses they were hardly used.

5.2 Formative use of Practical work

Formative use of practical work was sought by basing on the opinions of respondents towards seven competence areas. The respondents were required to indicate the rate of agreement or disagreement on the formative uses of practical work.

Table 5.2: Formative use of Practical Work

Item	SA	A	N	D	SD	Mean
Practical works are used as tools to facilitate the teaching and learning processes by instructors	11(4.8)	25(10.8)	45(19.5)	91(39.4)	59(25.5)	2.2987
Practical works are used by instructors to help students develop content (subject matter) skills	6(2.6)	3(1.3)	16(6.9)	83(35.9)	123(53.2)	1.6407
Practical works are used by instructors to help students develop pedagogical skills	11(4.8)	17(7.4)	38(16.5)	83(35.9)	82(35.5)	2.0996
Instructors use Practical works to help students design the schemes of work	8(3.5)	5(2.2)	39(16.9)	92(39.8)	87(37.7)	1.9394
Instructors use Practical works to help students design the lesson plans	6(2.6)	22(9.5)	53(22.9)	89(38.5)	61(26.4)	2.2338
Practical works provide information to students aimed at finding the	11(4.8)	12(5.2)	17(7.4)	100(43.3)	91(39.4)	1.9264

weaknesses and strengths
in the learning process

Instructors use Practical works to enhance team working spirit among students	4(1.7)	11(4.8)	27(11.7)	94(40.7)	95(41.1)	1.8528
overall mean						1.9988

Key: Strongly Agree (SA) = (4.5 – 5.0), Agree (A) = (3.5 – 4.4), Neutral (N) = (2.5-3.4), Disagree (D) = (1.5 – 2.4), Strongly Disagree (SD) = (1.0 – 1.4)

Source: Field data (2021)

The formative use of practical work was considered by looking at the seven competences. The opinion was sought to those seven areas with regard to formative use of practical work. One of the competences, however, had higher rate of disagreement on the formative use of practical work. This area with the highest rate of disagreement was practical works are used by instructors to help students develop content (subject matter) skills. The results indicated that majority 123 (53.2%) of the respondents strongly disagreed, and 83 (35.9%) disagreed respectively as indicated in the Table 5.2. The overall mean on the respondents’ opinion is 1.99 indicating the respondents to disagree on the formative use of practical work.

Qualitative findings supported the quantitative findings in that practical work was seen to be not used for the sake of improving teaching and learning process rather for grading. For example, one instructor from institution ‘A’ had this to say:

.....but for practical work it depends, the practical we are conducting here (at university) in both chemistry and biology are summative because when you are done with the practical is over it is like you are doing the final university examination. Once you are done it is the end of it; is considered for grading.

This response is similar to the quantitative data showing that practical work was not used formatively by the instructors.

5.3 Formative use of teaching practice

Under the formative use of teaching practice, the study intended to investigate whether is used formatively for the sake of improving teaching and learning processes. Seven competence areas were presented to respondents in order to seek the opinion from them as indicated in the Table 5.3.

Table 5.3: Formative use of teaching practice

Item	SD	D	N	A	SA	Mean
Teaching practice is used by instructors as tool to facilitate the	26(11.3)	10(4.3)	24(10.4)	40(17.3)	131(56.7)	4.039

teaching and learning processes by instructors							
Teaching practice is used by instructors to help students develop content (subject matter) skills	15(6.5)	13(5.6)	33(14.3)	58(25.1)	112(48.5)	4.0346	
Teaching practice is used by instructors to help students develop pedagogical skills	21(9.1)	13(5.6)	30(13)	40(17.3)	127(55)	4.0346	
Instructors use teaching practice to help students design the schemes of work	11(4.8)	3(1.3)	15(6.5)	48(20.8)	154(66.7)	4.4329	
Instructors use teaching practice to help students design the lesson plans	24(10.4)	18(7.8)	18(7.8)	33(14.3)	138(59.7)	4.0519	
Teaching practice provides information to students aimed at finding the weaknesses and strengths in the learning process	11(4.8)	4(1.7)	19(8.2)	55(23.8)	142(61.5)	4.355	
Instructors use teaching practice to enhance team working among students	15(6.5)	12(5.2)	23(10)	50(21.6)	131(56.7)	4.1688	
Overall mean						4.1595	

Key: Strongly Agree (SA) = (4.5 – 5.0), Agree (A) = (3.5 – 4.4), Neutral (N) = (2.5- 3.4), Disagree (D) = (1.5 – 2.4), Strongly Disagree (SD) = (1.0 – 1.4)

Source: Field data (2021)

Respondents agreed that teaching practice is used for formative purpose as per competence areas (Table 4.7). However, two competences had higher rate of agreement than others. First competence was instructors use teaching practice to help students design the schemes of work. The results indicated that the majority 154 (66.7%) of the respondents strongly agreed, and 48 (20.8%) agreed respectively as indicated in the Table 5.3. Second competence which had

higher rate of agreement was on teaching practice provides information to students aimed at finding the weaknesses and strengths in the learning process. The findings indicated that the majority 142 (61.5%) of the respondents strongly agreed, and 55 (23.8%) agreed respectively (Table 5.3). The overall mean for the respondents' responses was 4.15 implying that respondents showed high level of agreement on the formative use of teaching practice.

In the qualitative part; the student from institution 'B' supports on the uses of teaching practice formatively as follows:

.....they differ actually it depends on the tools; when I begin with teaching practice I can say is a form of formative assessment because we have met a lot of teachers when doing teaching practice so we learnt from each other. For example, we met with other students from institution A who had two assessment sessions; at the beginning assessor assessed the way they teach then tries to note areas for improvement. Then comes for the second time for grading but here at our university (institution B) we are given seminar on how to teach then when we go to the fields. Assessor comes once for assessment in the class then after taking his results he/she provides some feedback; so I can say this is formative.

On the side of instructor from institution 'B' explains the formative use of microteaching and teaching practice:

Even microteaching I'm doing formatively because students have to prepare lesson plans. I usually check the lesson plans before, even here I have some lesson plans (He picks some of the lesson plans and shows them to the researcher) then I make correction on areas facing difficulties then if I see they have problems in areas of competences, I make correction. For the fieldwork, I mean teaching practice when we go there we assign some marks but we talk to them on mistakes they are making.

5.4 Formative use of Projects

Opinions from 231 respondents were sought on the formative use of projects basing on seven areas of competences. The respondents indicated the rate of agreement and disagreement on each competence area as follows:

Table 5.4: Formative use of Projects

Item	SD	D	N	A	SA	Mean
Projects are used as tools to facilitate the teaching and learning processes by instructors	163(70.6)	19(8.2)	34(14.7)	1(0.4)	14(6.1)	1.632
Projects are used by instructors to help students develop content (subject matter) skills	179(77.5)	19(8.2)	27(11.7)	0(0)	6(2.6)	1.4199

Projects are used by instructors to help students develop pedagogical skills	158(68.4)	31(13.4)	30(13)	0(0)	12(5.2)	1.6017
Instructors use Projects to help students design the schemes of work	167(72.3)	17(7.4)	38(16.5)	0(0)	8(3.5)	1.5435
Instructors use Projects to help students design the lesson plans	166(71.9)	26(11.3)	26(11.3)	2(0.9)	11(4.8)	1.5541
Projects provide information to students aimed at finding the weaknesses and strengths in the learning process	100(43.5)	17(7.4)	29(12.6)	12(5.2)	72(31.3)	2.7348
Instructors use Projects to enhance team working spirit among students	170(73.6)	29(12.6)	23(10)	2(0.9)	7(3)	1.4719
Overall Mean						1.7083

Key: Strongly Agree (SA) = (4.5 – 5.0), Agree (A) = (3.5 – 4.4), Neutral (N) = (2.5- 3.4), Disagree (D) = (1.5 – 2.4), Strongly Disagree (SD) = (1.0 – 1.4)

Source: Field data (2021)

The findings indicated that respondents disagreed on the formative uses of project by instructors as shown in the Table 5.4. However, two competences had the highest rate of disagreement as compared to other competencies. The first competence was projects are used by instructors to help students develop content (subject matter) skills. The results indicated that the majority 179 (77.5%) of the respondents strongly disagreed, and 19 (8.2%) disagreed. The second competence with the highest rate of disagreement was on instructors use projects to enhance team working spirit among students. The results indicated that the majority 170 (73.6%) strongly disagreed, and 29 (12.6%) disagreed (as summarized in the Table 4.9). The overall mean basing on the respondents opinions is 1.71 implying the highest rate of disagreement on the formative use of projects.

Qualitative findings through interview indicated projects to be rarely used in some courses while in other courses were minimally used. For example, one instructor from institution ‘B’ had this to say: project tends to be done once in a third year for Bachelor of Science chemistry students but for Bachelor of Science with Education students do not conduct any project

The response supports the quantitative findings showing the highest rate of disagreement on the formative uses of projects. For example, one of the instructors from institution 'A' had this to say on project:

We are using projects, for example when teaching entomology they go to the field and collect insects. So projects are used by engaging students to carry out tasks in the field then after they write the report on what was observed. This is project-based learning.

The point of concern is that the undergraduate science students are involved in projects writing for the sake of being graded rather than improvement of weaknesses observed.

6.0 DISCUSSIONS

The findings indicated variations in the formative use of authentic assessment based on the tools namely portfolios, projects, teaching practice or fieldwork, and practical work. The authentic assessment was found to be minimally used on a formative basis to a great extent. This means that the uses of authentic assessment in general were based on grading purposes rather than improvement of the learning process. Since grading was given more emphasis than enhancement of learning; formative use was not observed. For authentic assessment to be considered for formative use; grading should not be involved (Torres, 2019). This means because undergraduate science students were graded as they performed the tasks; the uses involved were summative rather than formative. The findings are in line with Hilden et al. (2022) who insist on the emphasis on the summative use of authentic assessment tools. Likewise, Ishaq et al. (2020) comment on the dominant use of authentic assessment. The findings of the study and the cited authors indicate misuse of authentic assessment on a formative basis leading to a lack of active involvement in the learning process.

The variations in terms of respondents on the formative use that indicated disagreement on the formative use were well clarified through the interview. It was explained that portfolios were rarely used in science courses while some education courses were minimally used. Lack of use and minimal use of portfolios in science and education courses respectively had negative effects on the process of learning. This is because minimal use of portfolios was not for learning improvement but rather for the sake of grading students' achievement. The findings concur with Klenowski et al. (2006) and Orland-Barak and Maskit (2017) who comment on the summative use of portfolios for measuring students' achievement in various fields. The implication of the lack of formative use of portfolios is that the competencies accompanied with portfolios such as reflections, decision-making, organization, problem-solving and creativity could not be realized. For example, Andersson and Palm (2018) support the statement by arguing that despite the importance of the uses of portfolios in competencies acquisition; it was not well realized because of misuse or lack of use. Similarly, Leenknecht et al. (2021) insist on the beneficial effects of formative use of authentic assessment tools if used accordingly. This indicates that the contribution of portfolios and other authentic assessment tools was rarely realized.

Furthermore, practical work was found not to be used on a formative basis but rather on a summative. It was found that the emphasis given by instructors to students was to prepare practical-based reports on what was done which later were graded. This means the competencies that could be developed by individuals as they conduct practical work were rarely

observed because the emphasis was on grading learners' achievement. The experiments and other tasks performed by learners were not intended for the enhancement of learning but rather to accomplish the tasks for them to be graded. Basing on the interview findings it was found that practical work was based on grading rather than improvement of learning. For example, instructors had a belief that if students are not graded they become less engaged in carrying out the tasks given. Since the concern was the measurement of learning whether has taken place or not; practical work was done only once per week for the entire semester. This means there was no time for repeated doing of practical tasks for learners to internalize some ideas. But also, lack of repeated engagement in carrying out tasks risks the lack of innovation among them. Infrequency use or conduction of practical work per semester affects the acquisition of competencies among undergraduate science students.

The findings are in line with some studies (Abrahams et al., 2013; Mogali et al., 2020; Schwichow et al., 2016) that indicated inadequacy of use of practical work on a formative basis leading to inadequacy of competencies among graduates. For example, Constantinou and Fotou (2020) insist on the effectiveness of practical work in competencies acquisition among undergraduate science students; in that, if used on a formative basis such competencies may be realized. In addition, Osborne (2015) comments on the misuse of practical work leading to learners failing to acquire the stipulated competencies. It is well explained by minimal formative use of practical work which rarely actively engages learners. Such findings imply that the criticisms on inadequacy of competencies among graduates may persist based on poor formative use of authentic assessment tools.

Formative use was observed in the teaching practice or fieldwork as it played a key role in enhancing undergraduate science students' competencies. Since teaching practice engaged undergraduate science students fully throughout the exercise; the competencies such as pedagogical, content and generic were well acquired by them. The findings concur with (Amankwah et al., 2017; Jarrah, 2020; Makafane, 2020) who indicated the beneficial effects of teaching practice in enhancing learning. They comment that teaching practice links theory and practice by exposing undergraduate science students to the world of the teaching profession. Contrary to the findings of the study, some scholars indicate inadequacy of competencies among students as a result of teaching practice (Kafyulilo et al., 2013; Komba & Mwandaji, 2015; Mungure, 2016; Ndiokubwayo et al., 2020). The findings by these scholars call for a close examination of the formative use of teaching practice for the competencies to be acquired by students. The findings imply that the formative use of teaching practice has to be considered in a wider perspective if the acquisition of competencies among undergraduate science students should be realized.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

Based on the findings of the study it is concluded that formative use of authentic assessment was not well executed. The competencies acquisition among undergraduate science teachers is less likely to be acquired by undergraduate science students since formative use that contributes to competencies acquisition was not well implemented.

7.2 Recommendations

It is recommended that for higher education institutions to implement authentic assessment on a formative basis there should be an authentic assessment policy for their guidance. The Quality assurance organs should guide HEIs to formulate authentic assessment policies to be used by all academicians.

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