

Uses of Authentic Assessment Tools: Implications towards Competence Acquisition among Undergraduate Prospective Science Teachers in Tanzania

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Abstract: The study was concerned with the uses of authentic assessment tools in higher education institutions, particularly portfolios and practical work. The study employed the mixed method research approach with the explanatory sequential research design. The sample for the study involved 231 third year undergraduate prospective science teachers who were selected randomly and 6 instructors who were purposively selected from two higher learning institutions. Data was collected by using a questionnaire and a semi-structured interview. The findings indicated that authentic assessment tools namely portfolios and practical works were used both formatively and summatively though summative use was dominant. Portfolios were found to be minimally used both for formative and summative purpose. Findings from interview indicated that awareness on the formative uses of authentic assessment tools among instructors was minimal since summative use of such tools was observed to be dominant. It is concluded that the use of authentic assessment tools ranged from formative to summative, though summative was more dominant. Therefore it is recommended that there should be policy on the authentic assessment in higher education institutions to guide the effective use in both summative and summative aspects.

Keywords: Authentic assessment tools; formative; summative; practical work; portfolios.

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Introduction

There has been an increasingly growing interest on the use of authentic assessment in higher education worldwide (Ajjawi et al., 2020; Bosco & Ferns, 2014; Fox, Freeman, Hughes & Murphy, 2017; Kearney & Perkins, 2014; Ozan, 2019). Authentic assessment is the assessment which involves real-world tasks or tasks with real-life value and relate to the skills individuals will need in their future career (Ashford-Rowe, Herrington, & Brown, 2014; James & Casidy, 2018; Vu & Dall'Alba, 2014). The concern on the use of authentic assessment is due to the fact that it may lead the undergraduate prospective science teachers acquire competences useful in the field of teaching profession (Berger & Wild, 2017;

MacAndrew, 2008). The competences that may be acquired through the use of authentic assessment include generic, content and pedagogical competence (Cohen, Manion, Morrison & Wyse, 2010).

Generic or soft skills on one hand are those that support the hard skills or professional competences (Thambusamy, Singh & Ramly, 2014). They are important as they help individual learners and graduates in general to be in position to perform their daily duties effectively. On the other hand, content competences may be regarded as hard skills which form the key competences that an individual may acquire for performing tasks professionally.

For the competences to be acquired among the undergraduate prospective science teachers, the use of authentic assessment is quite important (Berger & Wild, 2017). This is because the use of authentic assessment determines timing and effort spend by the undergraduate prospective science teachers in doing the tasks (Bloxham & Boyd, 2007).

The use of authentic assessment with regard to competences acquisition focuses on the two purposes namely formative and summative (Falchikov, 2005; Rawlussyk, 2018).

The use of such authentic assessment tools in any of the purposes might lead to different results in terms of competences to be acquired. In addition, the use of authentic assessment tools may determine the achieved results of the undergraduate prospective science teachers. This being the case, it might be argued that the competences of individuals might be acquired depending on how the tools are used whether formatively or summatively. Since each purpose might lead to different results in terms of competences, the need arose to check on how these authentic assessment tools are used with regard to competence acquisition.

Summative use of authentic assessment tools such as portfolio and practical work involve the use of such tasks and activities for the sake of finding out if learning has taken place among the undergraduate prospective science teachers. Measuring if learning has taken place might involve grading and certification of learners' achievement by providing feedback that sums up the learning (Mokhtaria, 2015). However, summative assessment is considered to have negative effects to undergraduate prospective science teachers' learning (Falchikov, 2005; Ghaicha & Oufela, 2020; Rawlussyk, 2018). This is because it promotes surface learning (Bloxham & Boyd, 2007; Ramsden, 2003) which might not lead to competence acquisition rather than rote learning.

Formative use of authentic assessment tools is used for the sake of improving teaching and learning processes (Anderson, 2003; Irons, 2008; Petty, 2009) leading to competence acquisition. With such use in improvement of learning, formative use of authentic assessment tools is important in the teaching profession. This is because formative use of authentic assessment tool leads to acquisition and assessment of complex competences such as metacognition, critical thinking and creativity (Sale, 2020). Furthermore, formative use of authentic

assessment is concerned with the processes of seeking the strength and weaknesses of individual learners in the learning process. This is because they are engaged fully in the learning process as they perform the given tasks, hence acquiring competences in the process (Jopp, 2020; Mkimbili & Kitta, 2019). The competences that may be acquired by the undergraduate prospective science teachers when authentic assessment tools are used formatively include pedagogical, content and generic (Kearney & Perkins, 2014; Nguyen & Phan, 2020).

That being the case, the use of authentic assessment tools might to a great extent determine the competences of the undergraduate prospective science teachers. This is because learners are given opportunities to acquire the competences as they are involved in doing the tasks (Kearney & Perkins, 2014; Leenknecht et al., 2021). The purpose of using authentic assessment tools may influence the process of learning, hence competences acquisition. The world of teaching profession is in position to benefit from the graduates if they have the required employable competences for them to work in such world (Sokhanvar, Salehi & Sokhanvar, 2021). However, for them to be useful to the world of teaching profession depends largely on the authentic assessment tools used during their schooling. The way authentic assessment was used might indicate if the undergraduate prospective science teachers might have the required competences. The point of concern is how the higher education institutions are using these authentic assessment tools by focusing on the two purposes of use namely summative and formative. The ways these tools are used help to answer the questions on the inadequacy of competences among graduates (Komba & Mwandaji, 2015; Mutalemwa, Utouh & Msuya, 2020).

However, despite the discussion by different scholars on formative and summative assessment, the way authentic assessment tools are used in higher education with regard to competences acquisition among the undergraduate prospective science teachers is not clearly known; hence the concern for this paper was to examine the uses of authentic assessment tools with regard to competences acquisition among the undergraduate prospective science teachers.

Methodology

This part presents the research design, population and sampling procedures, instruments for data collection, validity and reliability and ethical consideration of the study.

Research Design

The study employed a mixed method research approach which involved integrating both quantitative and qualitative data in a single study in order to lead to a comprehensive understanding of the phenomenon under investigation (Leavy, 2017). Explanatory sequential design was adopted since the study focused on the use of qualitative data to clarify issues on the quantitative approach. This analysis began with the quantitative data followed by qualitative data as informed by Creswell (2012).

Population and Sampling

The target population for the study was 50 instructors and 650 third year undergraduate prospective science teachers specializing in biology and chemistry subjects from the College of Natural and Mathematics Sciences at the University of Dodoma (UDOM) and Mkwawa University College of Education (MUCE). The sample involved 231 third year undergraduate prospective science teachers by using proportional stratified random sampling as the concern was to get representativeness in terms of gender. Third year undergraduate prospective science teachers were selected because it was expected that they had more information on authentic assessment tools since they had been exposed to such assessment practices for almost three years of their study. In addition, three (3) instructors and six (6) undergraduate prospective science teachers were purposeful selected for interviews.

Instruments

Questionnaire with closed ended items was used to collect data among the respondents, particularly the undergraduate prospective science teachers on the uses of authentic assessment. The questionnaire was used because it is flexible and might collect objective information on the purpose of using authentic assessment among the undergraduate prospective science teachers (Johnson & Christensen, 2014; Singh, 2006). The questionnaire's scale of interpretation was as follows: Agree = 3.5 – 5.0, Neutral = 2.5– 3.4, Disagree= 1.0 – 2.4. Semi-structured interview was used to collect data on the uses of authentic assessment to three (3) instructors and six (6) undergraduate prospective science

teachers. Interview was used in order to get detailed explanation on how authentic assessment tools are used in higher education institutions.

Validity and Reliability

The Cronbach's coefficient alpha was calculated in order to ensure the reliability of the questionnaire in terms of internal consistency. This is because Cronbach's coefficient alpha may be used for estimating reliability for questions that have several possible answers (Gall, Gall & Borg, 2003). Cronbach's alpha was used as a measure of internal reliability on authentic assessment tool items. It is one of the most commonly used indicators of internal consistency (Pallant, 2016). The reliability statistics for each authentic assessment tools item are presented in the Table 1.

Table 1: Reliability Statistics

Variable	Items	Cr. Alpha
Portfolio formative	7	0.767
Portfolio summative	7	0.787
Practical formative	7	0.808
Practical summative	7	0.768

In the reliability statistics table 1, the Cronbach's alpha coefficients are positive above 0.7. These suggest good internal consistency. The values above 0.7 are considered acceptable (Johnson & Christensen, 2014; Pallant, 2016). Also the study was subjected to triangulation method (Johnson & Christensen, 2014) in data collection in that more than one research instruments namely questionnaire and interview schedule were used. Furthermore construct validity was considered by having a good definition of authentic assessment and explanation of the meaning of the construct of interest to the respondents who filled in questionnaire.

Ethical Considerations

The researcher adhered to research ethics by seeking a research permit to carry out the study. The permit was sought from the University of Dodoma and Mkwawa University College of Education. The letters given enabled the researcher to meet with instructors and students targeted for the study. During the meeting, the researcher introduced the purpose and the significance of the study. This enabled them to participate freely in interview and in filling in the questionnaires. Despite the official permission to conduct the research, informed consent was sought from the respondents.

Also confidentiality was assured to the respondents as they responded to interview questions plus filling in the questionnaires.

Findings and Discussion

Results of the study are presented basing on the research question; what are the uses of authentic assessment tools with regard to competences acquisition among the undergraduate prospective

science teachers? The results are presented on two aspects namely formative and summative uses. A demographic characteristic of the respondents is presented prior to the results of the study.

Demographic Characteristics

The Table 2 indicates 231 undergraduate prospective science teachers involved in the study from the two higher education institutions.

Table 2: Demographic Characteristics of the Respondents (n= 231)

Institution	Gender	Frequency	Total
A	Males	60	120
	Females	60	
B	Males	56	111
	Females	55	

Table 3: Formative use of Portfolio

Variable	Mean
Portfolios are used as tools or media to facilitate the teaching and learning processes by instructors	2.0173
Portfolios are used by instructors to help students develop content (subject matter) skills	1.6364
Portfolios are used by instructors to help students develop pedagogical skills	2.0563
Instructors use portfolios to help students design the schemes of work	1.5671
Instructors use portfolios to help students design the lesson plans	1.9524
Portfolios provide information to students aimed at finding the weaknesses and strengths in the learning process	1.8043
Instructors use portfolios to enhance team working spirit among students	1.7489
Overall	1.8261

The respondents were drawn from the target population of 650 students. The number was divided into 120 respondents from institution A and 111 from institution B as indicated in the Table 2.

Research Question: What is the trend of the use of authentic assessment tools with regard to competence acquisition among the undergraduate prospective science teachers?

The uses of authentic assessment tool may be categorized into two aspects namely, formative and summative. The findings are presented basing on these two forms of assessment. Table 3 shows the formative uses of authentic assessment tools as per the findings.

Formative use of Portfolio

Findings in the Table 3 indicate that the large number of respondents disagreed on the seven competence areas on the formative use of portfolios.

The overall mean on the formative use of portfolios with regard to respondents' opinion is 1.8261

implying disagreement on the formative use of portfolios. The findings indicate inadequacy or lack of use of portfolios in the higher education institutions under study. The findings are in line with some scholars (Caner, 2010; Sulaiman, Kotamjani & Rahim, 2020) who found portfolios to be underutilized especially in assessing learners in almost all fields of study. In contrast to the findings of this study, some studies indicated portfolios to be used for formative role (Händel, Wimmer & Ziegler, 2020; Muin, Hafidah & Daraini, 2021; Syamsul Ma'arif, Abdullah, Siti Fatimah & Nurul Hidayati, 2021; Tyas, 2020). They comment on the use of portfolios in improvement of teaching and learning processes among students. Based on the findings from this study, it may be evidenced that the institutions under study did not adhere to the formative use of portfolios which in one way or another could have negative impact to the competence acquisition. Yet studies have indicated that the answer to the critics of inadequacy of competences among graduates is formative use of authentic assessment tools such as portfolios

(Sokhanvar, Salehi & Sokhanvar, 2021; Villarroel, Bloxham, Bruna, Bruna & Herrera-Seda 2018). That being the case, the inadequacy or lack of competences among students (Komba & Mwandaji, 2015; Mutalemwa, Utouh & Msuya, 2020) may still persist since portfolios have been found to be underutilized.

Summative use of Portfolio

The research question required respondents to provide opinions by choosing the item based on the Likert scale; agree, neutral, and disagree as appears in table 4. The initiative for summative use of portfolios converge with Arjoon and Rambocas (2012) who advocated for the use of such tools in finding whether learning has taken place or not. On the contrary, Mokhtaria (2015) supports the summative use of portfolios for the sake of grading learners' achievement rather than improvement of the learning process.

The findings are presented based on the seven areas of competences. The overall mean for the summative use of portfolios is 1.9858 indicating

respondents disagreed on the summative use of portfolios for competence acquisition. The findings are related to those by Qadir et al. (2020) who commented that summative assessment measures learning outcomes through grades without giving constructive feedback on how to correct areas of weaknesses. Furthermore, Cervantes, García and Doña (2018) found instructors in higher education focusing on summative use of assessment for grading rather than facilitating learning.

Formative use of Practical Work

The formative use of practical work was considered by looking at the seven competences. The opinion was sought to those seven areas of competences with regard to formative use of practical work.

The findings for each competence area are presented in the Table 5. The overall mean on the respondents' opinion is 1.9987 indicating the respondents to disagree on the formative use of practical work.

Table 4: Summative use of Portfolio

Variable	Mean
Portfolios are used by instructors to grade students' achievements	2.0866
Portfolios are used by instructors to provide feedback to students on mastery of competences	2.1082
Portfolios are used as tools to measure communication skills among students	2.0736
Portfolios are used to measure students' knowledge and understanding of concepts	2.1082
Instructors use portfolios to measure ability of students in designing the assessment tools such as tests	1.6753
Portfolios are used by instructors to measure students' decision-making skills	2.2078
Portfolios are used to measure collaboration skills among students	1.6407
Overall	1.9858

Table 5: Formative use of Practical Work

Variable	Mean
Practical works are used as tools or media to facilitate the teaching and learning processes by instructors	2.2987
Practical works are used by instructors to help students develop content (subject matter) skills	1.6407
Practical works are used by instructors to help students develop pedagogical skills	2.0996
Instructors use Practical works to help students design the schemes of work	1.9394
Instructors use Practical works to help students design the lesson plans	2.2338
Practical works provide information to students aimed at finding the weaknesses and strengths in the learning process	1.9264
Instructors use Practical works to enhance team working spirit among students	1.8528

Summative use of Practical work

Basing on the use of practical work summatively, 231 respondents had different opinions with regard to competences acquisition. The findings are

presented on the basis of seven competences indicating the majority of the respondents to agree with the fact that practical work was used summatively by the instructors.

The results are summarized in the Table 6. The overall mean for the response for all respondents was 4.15 which imply them to have high degree of agreement on the summative use of practical works.

Qualitative Data Findings

On the side of the findings from interview data, basing on the uses of authentic assessment tools

with regard to competences acquisition among the undergraduate prospective science teachers, the concern was to find out how authentic assessment tools namely portfolio and practical work were used under the two aspects namely formative and summative.

Table 6: Summative use of Practical work

Variable	Mean
Practical works are used by instructors to grade students' achievements	4.0866
Practical works are used by instructors to provide feedback to students on mastery of competences	4.1342
Practical works are used as tools to measure communication skills among students	4.013
Practical works are used to measure students' knowledge and understanding of concepts	4.0043
Instructors use Practical works to measure ability of students in designing the assessment tools such as tests	4.2857
Practical works are used by instructors to measure students' decision-making skills	4.2814
Practical works are used to measure collaboration skills among students	4.3117
Overall	4.1595

One of the respondents (instructor) had this to say:

Most activities like portfolios, I can consider them formative; I consider formative because they are done in the process of teaching and learning. But for practical work, it depends. The practical we are conducting here (at university) may be summative because when you are done with the practical, it 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.

Respondents further insisted on the formative and summative use of authentic assessment tools though agreeing that summative use is given much emphasis in that 40% is for coursework and 60% is for the final university examination. The second respondent (instructor) had similar views on the use of authentic assessment tools formatively or summatively:

I can say I'm using them both, first of all. At the end, I will grade, therefore in the process, I use formatively, but at the end of the day I will grade. I do for the purpose of improving learning but at the end of the day, there will be grades assigned.

The respondent justified the summative use of authentic assessment tools with the following comment:

The nature of our students is that when you go for formative alone, few of them will be serious in studying. They are concerned with how much will they get. How much can I score if I do this? So if you just consider formative, few of them will do the tasks.

The third respondent (instructor) had a similar argument with regard to the formative and summative use of authentic assessment tools: "We use both formative and summative. Teaching is a continuous process, so you cannot wait till the end for grading. If you want to find the degree how learners have done, how are you going to do it without grading?"

Respondents further focused on the uses of authentic assessment both formatively and summatively, with the emphasis of grading. For example one of the respondents (instructor) stressed the use of authentic assessment tools formatively with the emphasis of grading as follows: "So how will learners improve without grading? At the end you must assign grades even if it is 2 marks. We give them a lot of tasks with little marks; otherwise they won't be serious if grading is not involved.

On the side of the undergraduate prospective science teachers, it was also found that authentic assessment tools are used both formatively and summatively. The common authentic assessment tools used were portfolios and practical work. When they were asked to explain how authentic

assessments are used with regard to formative of summative uses, they commented that the tools are used both formatively and summatively. For example one respondent (student) had this to say: "Authentic assessment tools are for both teaching and learning processes and for grading; after constructing portfolios, they emphasize to present what has been designed."

A respondent (student) from institution B insisted on the use of authentic assessment tools formatively and summatively as follows:

When it comes to formative, I can say practical are in form of formative. For example, we conduct practical, we make mistakes then they correct the mistakes. Thereafter we write the report; so I can say it is a form of trial and errors.

Findings from interviews indicate both formative and summative uses of authentic assessment tools. However, there seems to be lack of awareness on the formative use of authentic assessment and the provision of formative feedback among instructors. For example, instructors indicated that they used authentic assessment tools for both formative and summative while the findings indicated only summative. This means they were not aware on what makes formative use. Instructors are required to possess competences on how to use authentic assessment formatively but also to provide formative feedback which might help learners improve the learning process. On one hand, the findings are in contrast to the findings from some scholars (Clarke & Boud, 2018; Franco et al., 2017; Haliq & Sakaria, 2019) who indicated both formative and summative uses of authentic assessment tools. They indicated that when authentic assessment tools serve both purposes, it may lead to meaningful learning which in turn leads to the acquisition of competences.

Lack of awareness on the use of assessment formatively is supported by Gibbs (2006) who argued that for an assessment to be formative or summative it is not the timing of it, rather the purpose. The instructors involved in the study had an understanding that if the tasks are provided as the course progresses, it is automatically viewed as formative even if grades are involved. Such misconception on summative and formative uses of authentic assessment by instructors makes summative use to be dominantly used. The dominant use of authentic assessment on

summative basis was also indicated by Irons (2008) who claimed that assessment in higher education is still instructors-centered rather than learner-centered.

The point of concern is that if the authentic assessment tools are wrongly used, then it is likely to bring negative results. The formative use of authentic assessment tools should focus on improvement of the learning process among the undergraduate prospective science teachers rather than grading. Mumm and Karm (2016) support this view of grading in that in higher education, learning is grade-centered implying the summative nature of its use. For the authentic assessment to be formatively used, the focus should not be grading, rather the learning processes involved behind the given tasks. This means if the emphasis will be on grading, the use will shift from formative to summative which might in one way or another affect the competences among the undergraduate prospective science teachers. The reason behind for the support of formative use of authentic assessment as argued by Bloxham and Boyd (2007) is that, it may lead to positive use of time and effort in the learning process.

Conclusions and Recommendations

Conclusion

The study concludes that the authentic assessment tools were found to be used for both formative and summative purpose. However, summative use was found to be dominant as instructors believed that when authentic assessment tools did not involve grading, learners would not be as serious as expected. This made the summative use of authentic assessment tools in the higher education institutions to dominate as the concern was final grading rather than learning. Furthermore, it may be concluded that instructors in the higher education institutions under study had little awareness on formative uses of authentic assessment tools.

Recommendations

It is recommended that the formative use of authentic assessment tools should be given more emphasis as it is one of the forms that may equip the undergraduate prospective science teachers with employable competences in the field of teaching. Higher education institutions should have the authentic assessment policy which insists on the formative use of such for the sake of competence acquisition. The presence of policy will enable instructors to use authentic assessment tools

formatively hence avoiding dominance of such tools summatively.

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