# Examination of the relationship between authentic assessment and generic competencies among undergraduate science student-teachers in Tanzanian universities

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**Abstract.** This paper investigates the relationship between authentic assessment tools and the acquisition of generic competencies among undergraduate science student-teachers in Tanzanian universities. Employing a quantitative research approach, data were gathered through questionnaires and document reviews. A sample of 231 undergraduate science student-teachers was selected using stratified proportional random sampling. The collected data underwent analysis using a multiple linear regression model. Results revealed a significant relationship between authentic assessment tools and generic competencies, with variations in generic competencies accounting for 50 per cent of the variations in authentic assessment tools. The study underscores the necessity of establishing an authentic assessment policy within universities to ensure its comprehensive implementation.

**Keywords:** portfolios · practical work · projects · teaching practice

## 1 Introduction

In recent years, the exploration of authentic assessment tools' roles in fostering generic competencies among learners has garnered considerable attention [2, 22, 42, 52, 55]. Authentic assessment, characterized by its alignment with real-world experiences, serves as a cornerstone in nurturing skills indispensable for navigating professional environments. Generic competencies, often synonymous with soft skills, are increasingly acknowledged as pivotal for graduates' success in the workforce, complementing content-based proficiencies [10, 56]. These competencies bridge the gap between academic knowledge and practical application, ensuring graduates are well-equipped to meet the demands of their chosen professions [14].

While numerous studies have delved into the significance of generic competencies across various professions, particularly in education [5, 14, 34, 46, 56], a deeper understanding of how these competencies are acquired and enhanced

within university settings is warranted. Communication, collaboration, problem-solving, and critical thinking are among the generic competencies underscored as essential for success in the teaching profession [14, 50, 56], not only enhancing individual effectiveness but also contributing to overall workplace efficiency [29, 41].

Authentic assessment emerges as a pivotal strategy for assessing and cultivating generic competencies within university contexts [17, 38]. Diverging from traditional assessment methods, authentic assessment tools such as reflective journals and managerial reports closely align with real-world contexts, providing comprehensive evaluations of learners' abilities [3, 17, 45]. However, while some studies have scrutinized the acquisition of generic competencies through teaching processes [53, 54, 56], others have spotlighted the role of authentic assessment in this process [25, 55]. Despite these insights, a gap persists in understanding the specific relationship between authentic assessment tools, such as portfolios, projects, teaching practice, and practical work, and the acquisition of generic competencies among undergraduate science student-teachers.

This study endeavours to bridge this gap by examining how authentic assessment tools intersect with the acquisition of generic competencies among undergraduate science student-teachers. By elucidating the connection between assessment strategies and competency development, this research aims to inform teaching practices and curriculum design, ultimately enhancing students' preparation for the professional realm.

## 2 Literature review

The literature on authentic assessment tools provides valuable insights into bridging the gap between academic learning and real-world professional demands. This section synthesizes relevant literature to elucidate the theoretical underpinnings of authentic assessment, focusing on its significance in enhancing undergraduate science student-teachers' acquisition of generic competencies. Moreover, it critically examines the relationship between various authentic assessment tools and the development of essential skills required in professional settings.

### 2.1 Theoretical framework

Authentic assessment tools are grounded in constructivist learning theories, emphasizing active student engagement, real-world relevance, and the application of knowledge [31, 41]. Drawing upon socio-constructivist perspectives [47], these tools are designed to mirror professional contexts, encouraging learners to demonstrate their understanding through meaningful tasks [55]. By aligning assessment practices with the principles of authentic learning, educators seek to foster deep understanding, critical thinking, and skill transferability [5].

### 2.2 Scope and selection of literature

To ensure the comprehensiveness and currency of the literature review, recent studies pertaining to the impact of information and communication technology (ICT) on education have been incorporated. This inclusion expands the scope to encompass contemporary trends and advancements in educational assessment. Moreover, the selection process involved rigorous scrutiny to identify seminal works and empirical studies relevant to the research context, thereby enriching the theoretical framework and underpinning the study's rationale.

### 2.3 Authentic assessment tools

Authentic assessment tools represent forms of assessment that bridge the gap between academia and the professional world beyond graduation [31, 41, 55]. These tools aim to connect students' learning experiences at the university level with the demands and expectations of real-world professional settings. They encompass various methods such as portfolios, projects, practical work, and teaching practice, all designed to engage learners actively in the performance of tasks.

**Portfolio** A portfolio is defined as a curated collection of evidence showcasing a student's learning journey and acquired knowledge [15, 57]. It serves as a dynamic tool for active participation and reflection, aligning with the principles of authentic assessment. Portfolios not only document and communicate student progress over time but also foster competencies crucial for undergraduate science student-teachers [9, 12, 36, 43]. However, the extent to which portfolios contribute to the acquisition of generic competencies among undergraduate science student-teachers remains underexplored, particularly concerning their predictive power in this regard.

**Project** Project-based learning offers students opportunities to tackle authentic problems, fostering critical thinking and skill development [11, 32, 37]. While projects have been associated with the acquisition of generic competencies and teaching professional skills among learners [8, 21, 27], the relationship between projects and the acquisition of generic competencies among undergraduate science student-teachers warrants further investigation.

**Teaching practice** Teaching practice, also known as practicum, provides undergraduate science student-teachers with valuable hands-on experience in real classroom settings [35]. While it is widely acknowledged as a significant contributor to competency acquisition [6, 19], the specific relationship between teaching practice and the acquisition of generic competencies remains unclear.

**Practical work** Practical work, characterized by hands-on activities in laboratories or science teaching settings, plays a pivotal role in linking theory with practice [1, 18]. Studies suggest that practical work enhances learning outcomes and contributes to the acquisition of teaching professional competencies [13, 40, 49]. However, further research is needed to explore the relationship between practical work and the acquisition of generic competencies among undergraduate science student-teachers, including its predictive power in this context.

## 3 Methodology

The study adopted a quantitative research approach aimed at numerically summarizing results and grounded in the principle of realism [16, 26]. This approach was selected considering the study's objective of examining the relationship between authentic assessment tools and generic competencies among undergraduate science student-teachers. By employing quantitative methods, the study aimed to identify and quantify these connections effectively. The choice of a quantitative approach was deemed appropriate, given the nature of the research questions and objectives. Previous literature has highlighted the suitability of quantitative methods in investigating relationships between variables and providing numerical insights into phenomena [24, 26]. This approach offers a structured framework for data collection, analysis, and interpretation, thereby enhancing the transparency and trustworthiness of the research findings.

### 3.1 Population and sampling

The target population consisted of third-year undergraduate science student-teachers specializing in biology and chemistry subjects at two universities in Tanzania. A sample of 231 third-year undergraduate science student-teachers focusing on Chemistry and Biology subjects was selected using proportional stratified random sampling. This sampling technique ensured the representation of genders among the undergraduate science student-teachers, enhancing the generalizability of the findings.

### 3.2 Methods of data collection

This study utilized questionnaires and document review methods for data collection. Close-ended questionnaires were administered to undergraduate science student-teachers to gather data on the relationship between authentic assessment tools and generic competencies. Questionnaires were chosen for their flexibility and ability to collect objective information on the study variables [24, 51]. To mitigate the potential low return rate associated with mailed or posted questionnaires, personal administration was ensured.

Document review involved the examination of journal articles providing insights into generic competencies in universities and specific requirements within the teaching profession. Additionally, course outlines from Biology, Chemistry,

and Educational courses were scrutinized. Some documents were accessed as hard copies from the library, while others were downloaded from online sources. These documents complemented the data collected through questionnaires. Despite the age and varied contexts of some references, they were included in the analysis due to their relevance to the study objectives.

## 4 Findings and discussion

A multiple linear regression model was employed to investigate the relationship between authentic assessment tools and generic competencies. Scores derived from the assessment tools and generic competencies were computed and utilized for analysis. The results are summarized in table 1.

**Table 1.** Relationship between tools of authentic assessment and generic competence.

| Generic competence score | Coef. | St.Err. | t-value | p-value | Sig |
|---|---|---|---|---|---|
| Portfolio score | 0.190 | 0.049 | 3.90 | 0.000 | *** |
| Project score | 0.113 | 0.024 | 4.70 | 0.000 | *** |
| Practical score | 0.030 | 0.012 | 2.50 | 0.034 | ** |
| Teaching score | 0.441 | 0.054 | 8.17 | 0.000 | *** |
| Constant | 40.804 | 5.836 | 6.99 | 0.000 | *** |
| Mean dependent var | 21.145 | | SD dependent var | 6.876 | |
| R-squared | 0.503 | | Number of obs | 227.000 | |
| F-test | 24.073 | | Prob > F | 0.000 | |
| Akaike crit. (AIC) | 1446.761 | | Bayesian crit. (BIC) | 1463.886 | |

*** $p < .01$, ** $p < .05$, * $p < .1$

Multiple linear regression analysis was conducted to explore the relationship between authentic assessment tools and the generic competence of undergraduate science students. The results revealed that the independent variables included in the model were strong predictors of generic competence among undergraduate science student-teachers. Approximately 50.3 per cent of the variations in generic competence were accounted for by the variations in the explanatory variables included in the model. Moreover, the collective influence of the explanatory variables included in the model significantly impacted the generic competence of undergraduate science students ($F = 24.073, p < 0.001$).

Interestingly, the predictor variable "Practical work" did not significantly influence the generic competence of the undergraduate science students in the study area. In contrast, the predictor variables "Portfolio score", "Project score", and "Teaching score" significantly influenced the generic competence of the undergraduate science student-teachers.

Specifically, the Teaching score demonstrated a significant influence ($p < 0.001$) on the generic competence of undergraduate science student-teachers, with a coefficient of 0.441. This suggests a direct proportional relationship, im-

plying that an increase in teaching practice scores results in a corresponding increase in generic competence.

Similarly, both the Portfolio score and Project score showed significant impacts ($p < 0.001$) on generic competence. The coefficients were 0.190 and 0.113, respectively. This indicates positive relationships, with higher scores in portfolios and projects corresponding to increased generic competence among undergraduate science student-teachers.

Further analysis revealed that certain generic competencies, such as communication skills and decision-making, were associated with teaching practice and projects. Collaboration and teamwork were linked to practical work, while reflection and organization were associated with portfolios. These findings underline the importance of authentic assessment tools in fostering key employable skills sought by employers as they determine graduates' ability to execute both hard and soft skills.

These results resonate with prior research findings by Mogali et al. [33], Schwichow et al. [48], and Shana and Abulibdeh [49], which suggested that practical work might not effectively contribute to the acquisition of generic competencies among students. However, contrasting views were presented by Martindill and Wilson [30] and Okam and Zakari [40], who highlighted practical work's role in developing competencies such as self-confidence and autonomy, albeit without specifying the link to generic competencies.

The findings regarding portfolios, teaching practice, and projects align with previous studies such as those by Amankwah et al. [6], Jarrah [23], and Makafane [28], which emphasized the positive influence of teaching practice on the development of generic competencies among prospective teachers. Additionally, Hagos et al. [19] and Halimah and Syaddad [20] identified specific competencies, such as problem-solving and creativity, that may be fostered through teaching practice among student-teachers.

In the case of portfolios, Nicol et al. [36] and Paz-Albo Prieto et al. [43] suggested that students actively engaged in constructing portfolios tend to acquire competencies such as organization, creativity, and reflection. However, conflicting perspectives were presented by Alfiani and Hermilia Wijayati [4] and Nyinge [39], who argued that portfolios are inadequately utilized on a summative basis, thereby hindering the acquisition of generic competencies among undergraduate science student-teachers.

Overall, these findings support the notion that authentic assessment tools have a significant relationship with generic competencies, consistent with previous research by Arlianty et al. [7], Maniram and Maistry [29], Miller and Konstantinou [31], Olivares et al. [41], and Pham et al. [44]. However, further exploration is needed to elucidate the specific relationships between each authentic assessment tool and generic competencies.

## 5 Conclusions

This study has thoroughly explored the relationship between authentic assessment tools and the development of generic competencies among undergraduate science student-teachers. The findings underscore the crucial role played by authentic assessment tools in enhancing the acquisition of these competencies, which are not only vital for academic success but also for professional efficacy beyond graduation. Moreover, the study illuminates the reciprocal nature of generic competencies in supporting student-teachers throughout their careers by facilitating the application of both content knowledge and pedagogical skills. The observed significant relationship between authentic assessment tools and generic competencies suggests that variations in assessment methods can contribute to differences in competency levels among student-teachers.

As a result, the integration of authentic assessment practices, such as portfolios, projects, teaching practices, and practical work, becomes imperative for universities aiming to cultivate competent graduates. Recognizing the diverse benefits offered by different assessment tools emphasizes the necessity of employing a varied approach to assessment in educational settings. The intrinsic link between authentic assessment tools and generic competencies prompts a critical examination of how higher education institutions are utilizing these tools in the teaching and learning process. This inquiry is essential for optimizing educational practices and ensuring the effective development of competencies among student-teachers. Therefore, this study advocates for the widespread adoption of authentic assessment practices in universities, emphasizing the importance of employing a diverse range of assessment tools to foster the comprehensive development of generic competencies among undergraduate science student-teachers.

## 6 Recommendations

Based on the findings of the study, the following recommendations are suggested:

- Universities should prioritize the complete integration of authentic assessment methods to facilitate the acquisition of generic competencies among undergraduate science student-teachers. This involves incorporating diverse and meaningful assessment tools that reflect real-world contexts and challenges.
- To ensure the effective implementation of authentic assessment, universities should develop comprehensive policies specifically dedicated to authentic assessment practices. These policies should outline clear guidelines, standards, and procedures for the integration of authentic assessment across various disciplines and programs.
- Authentic assessment policies should be uniformly enforced across all academic fields within the university, including education, natural sciences, and social sciences. This ensures consistency and equity in the assessment practices adopted across different departments and programs.

By fully embracing authentic assessment practices and establishing robust policies to support their implementation, universities can better prepare undergraduate science student-teachers with the essential generic competencies needed for success in their academic and professional endeavours.

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