Examining the Role of Authentic Assessment Tools: Frequency and Their Influence on Pedagogical Competence among Undergraduate Science Student-Teachers in Tanzania

Baraka Nyinge
Department of Educational Psychology and Curriculum Studies
University of Dodoma
nyingebaraka@gmail.com
ORCID: https://orcid.org/0000-0002-8197-6675

Abstract
Authentic assessment is an important area in the acquisition and demonstration of competencies. The study investigated authentic assessment tools in Higher Education Institutions in terms of frequency and relationship with pedagogical competence. The study employed a quantitative research approach with a descriptive survey design to describe the frequency and relationship between authentic assessment tools and pedagogical competence. The study involved 231 third-year undergraduate science student teachers who were selected by proportional stratified random sampling. The findings indicated that the frequency of using authentic assessment tools varied per tool, ranging from once per week for practical work and once per semester or year for teaching practice, portfolio, and project. Furthermore, findings indicated a significant relationship between authentic assessment tools and pedagogical competence. It was found that 66.2 per cent of the variations in pedagogical competence were explained by variations in the authentic assessment tools. The study concludes that the frequency of using authentic assessment tools determines the acquisition of competencies among students. Similarly, it is concluded that the usage of authentic assessment tools significantly relates to pedagogical competence. It is thus recommended that Higher Education Institutions formulate policies on the use of authentic assessment tools.

Keywords: *Authentic assessment, practical work, portfolios, project, pedagogical, competence*

Introduction

There is a growing consensus among scholars that authentic assessment plays a crucial role in developing and demonstrating teaching professional competencies (Dahlback et al., 2020; Koh et al., 2019; Mcarthur, 2020). Authentic assessment, defined as assessment methods reflecting real-life experiences (Vu & Dall'Alba, 2014), actively engages students in task performance, which is particularly beneficial for undergraduate science student-teachers in acquiring pedagogical competencies (De Prada et al., 2

022; Odumosu & Areelu, 2018). Moreover, it enables them to showcase these competencies effectively (Aliu & Aigbavboa, 2021; Çiçek & Taşpınar, 2021), thereby enhancing the learning process (Quansah et al., 2019; Tkatchov et al., 2022; Villarroel et al., 2018).

Despite the widespread use of authentic assessment in higher education institutions (HEIs), critiques persist regarding graduates' perceived inadequacies in competencies (Kafyulilo et al., 2013; Komba & Mwandaji, 2015; Quansah et al., 2019), articulated by both employers and graduates (Ashford-Rowe et al., 2014; Villarroel et al., 2018). While studies acknowledge the role of authentic assessment tools in measuring and enhancing learning and competencies (De Prada et al., 2022; McArthur, 2022), there remains a gap in understanding the frequency of tool usage and its correlation with pedagogical competence acquisition.

Pedagogical competence, crucial for effective teaching and student management (Cohen et al., 2010), necessitates active student engagement in task execution for competency acquisition. While some studies explore the frequency of authentic assessment usage (Nicol et al., 2019; Oudkerk Pool et al., 2020), and others examine the relationship between tool usage and teaching professional competencies (De Prada et al., 2022; Žerovnik & Nančovska Šerbec, 2021), a few address both aspects simultaneously. This paper addresses this gap by investigating the frequency of authentic assessment tool usage and its relationship with pedagogical competence among undergraduate science student-teachers in Tanzania.

This study was guided by the following research questions: What is the frequency of authentic assessment tool usage in HEIs? And, what is the relationship between authentic assessment tool usage and pedagogical competence? By addressing these questions, this study seeks to contribute to a deeper understanding of the role of authentic assessment in fostering teaching competencies and informing educational practices.

Authentic Assessment Tools in Higher Education Institutions

Authentic assessment tools encompass forms of assessment that simulate real-life situations, actively engaging students in tasks conducive to learning enhancement. While several scholars have extensively documented authentic assessment tools relevant to demonstrating or acquiring competencies among undergraduate science student-teachers (James & Casidy, 2018; Kinay & Bagceci, 2016; Olfos & Zulantay, 2007), there remains a notable gap in the literature regarding their specific application and effectiveness within higher education institutions.

For example, Ellis et al. (2020) explained the effectiveness of the use of authentic assessment tools in preventing cheating among students. They argued that authentic assessment tools involve real-life experiences and engage students actively in carrying out such tasks, making them less likely to commit cheating. Furthermore, Silveira et al. (2017) indicated the use of authentic assessment to enhance reflective competencies among students as they are actively engaged in carrying out the tasks. Likewise, Sewagegn and Diale (2020) commented on the great role of authentic assessment tools in promoting students' learning, leading to competency acquisition. This study sought to address this gap by examining four specific authentic assessment tools: portfolios, projects, teaching practice, and practical work, and their implications for enhancing pedagogical competencies among student-teachers.

Pedagogical Competence and the Role of Authentic Assessment Tools

Pedagogical competence, often defined as the capacity to facilitate learning among learners through various teaching methods and an understanding of learners and their characteristics, is crucial for effective teaching (Joanna et al., 2018; Shulman, 1987). Schneider and Plasman (2011) underscore its significance as a unique competence essential for teaching and the development of expertise, encompassing knowledge of learning principles, instructional strategies, and classroom management skills (Kitta, 2004). This competence extends to decision-making regarding the selection and application of teaching methods suitable for different contexts and student groups (Koludrovic & Ercegovac, 2017).

Effective pedagogical knowledge ensures that subject matter is effectively conveyed to learners, distinguishing competent teachers from those who may require further development in the profession (Anoh, 2021). It is not solely about possessing content knowledge but also about delivering it effectively to learners. Pedagogical knowledge equips teachers, including undergraduate science student-teachers, with the competencies necessary to organise and manage classrooms and select appropriate teaching methods (LeeShing et al., 2015).

Moreover, pedagogical competencies influence learner motivation and engagement, with instructors possessing strong pedagogical knowledge reinforcing learning through appropriate teaching approaches, positive reinforcement, and suitable teaching materials (Adamu & Mohammed, 2022). Kihwele and Mtandi (2020) further highlight a positive relationship between authentic assessment tools, particularly teaching practice and the acquisition of pedagogical competencies among prospective teachers. They argue that engagement in teaching practice enhances competencies such as the selection and utilisation of teaching and learning materials.

While some studies suggest a positive association between teaching practice and pedagogical competence (Amankwah et al., 2017; Kihwele & Mtandi, 2020), others, like Mungure (2016), indicate that teaching practice may not always effectively enhance pedagogical competence due to ineffective implementation. However, the specific relationship between authentic assessment tools and the acquisition of pedagogical competencies remains understudied. This study addresses this gap by investigating how pedagogical knowledge may be acquired through the use of authentic assessment among undergraduate science student-teachers. Additionally, it explores the relationship between authentic assessment tools and the development of pedagogical competencies, shedding light on their potential impact on teacher education and practice.

Methodological considerations

This study employed a quantitative research approach utilising a descriptive survey research design. The quantitative approach facilitated the collection of a substantial amount of data within a limited timeframe (Lodico et al., 2010)A descriptive survey research design was chosen to elucidate the frequency and relationships between authentic assessment tools, such as portfolios, projects, practical work, and teaching practices, and undergraduate science student-teachers pedagogical competencies.

The study's target population consisted of 650 third-year undergraduate science student-teachers specialising in Biology and Chemistry subjects at two universities in Tanzania. The sample for this study was drawn from third-year science student-teachers enrolled in a Bachelor of Science with an Education Degree program at two Higher Education Institutions (HEIs). These two HEIs were chosen based on their significant enrollment figures compared to other institutions offering BSC ED degree programmes in Tanzania (TCU, 2021). Third-year science student-teachers were selected as participants because they were expected to have encountered various assessment tasks throughout their three years of study. Participants were chosen through proportional stratified random sampling to ensure gender representation. A total of 231 respondents were selected as the sample from both institutions, as indicated in Table 1.

Table 1: Demographic characteristics of the science student-teachers (n= 231)

Institution	Gender	Number of Participants
A	Males	60
	Females	60
	Males	56
B	Females	55
	Total	**231**

The data were collected through questionnaires. Close-ended questionnaires were administered to undergraduate science student-teachers to collect data on the frequency and relationship between authentic assessment tools and pedagogical competencies. The questionnaires were designed by a researcher and conducted face-to-face, where respondents were provided with the instruments to fill out and later collected by the researcher. These questionnaires were structured in a Likert scale format. The Likert scale allowed respondents to indicate their level of agreement or disagreement with a series of statements. Typically, response options ranged from "Strongly Disagree" to "Strongly Agree," with various degrees of agreement in between. Questionnaires were selected due to their flexibility and capacity to gather objective information on the study variables (Johnson & Christensen, 2014; Singh, 2006). Personal administration was ensured to address potential issues related to low return rates associated with mailed or posted questionnaires.

To ensure the reliability of the research instruments, a pilot study was conducted using third-year undergraduate science student-teachers at a different HEI. The pilot study checked out the relevance, readability, suitability, and applicability of the items in the questionnaires. It provided helpful information that helped to modify the questionnaire by eliminating redundant questions. Likewise, the items that needed to be clarified to the respondents were modified for clarity. Furthermore, the pilot study helped establish the relevance of the suggested research instruments to the research questions. The Cronbach's coefficient alpha was calculated to ensure the reliability of the questionnaire in terms of internal consistency. This is because Cronbach's coefficient alpha is used to estimate reliability for questions with several possible answers (Gall et al., 2003). Cronbach's alpha was used as a measure of internal reliability.

Findings

The findings of the study are presented in terms of research questions hereunder.

The Frequency of Instructors Using Authentic Assessment Tools

The study examined the frequency of using authentic assessment tools, such as portfolios, projects, practical work, and teaching practice, among instructors in higher education institutions. The findings indicated the frequency of use of authentic assessment tools, as presented in the figures below.

Frequency of project usage by Instructors

Projects, as one of the authentic assessment tools, were utilised by instructors; however, the frequency of use varied per semester or per year.

For instance, as depicted in Figure 1, 30 per cent of the respondents indicated that projects were used once per semester, 20 per cent indicated projects were used once per year, and 50 per cent indicated that projects were not used at all. The frequency of using projects, as reported by respondents, fell between infrequent use and non-use entirely. This suggests that projects were not commonly employed, as illustrated in Figure 1, with their utilisation limited to once per semester or year. The aim was to ascertain the frequency with which instructors utilised projects, whether weekly, semesterly, or yearly.

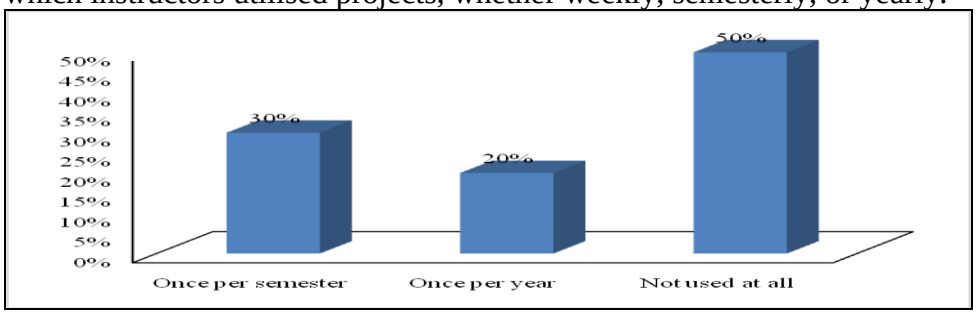

Figure 1: Frequency of using projects

Frequency of portfolio usage by Instructors

The study revealed that instructors employed portfolios, albeit at minimal rates. For instance, 18 per cent of the surveyed respondents (undergraduate science students) reported the use of portfolios once per semester, while 22 per cent reported usage once per year. Notably, 60 per cent of respondents indicated that portfolios were not used at all, as illustrated in Figure 2.

Interview findings from both instructors and undergraduate science students indicated a lack of portfolio utilisation across all courses in biology and chemistry subjects. Additionally, in educational courses, portfolios were only employed in select courses such as teaching methods and those related to curriculum and instruction. This underscores the infrequent usage of portfolios, even in courses where they were implemented, typically occurring either once per semester, per year, or not at all.

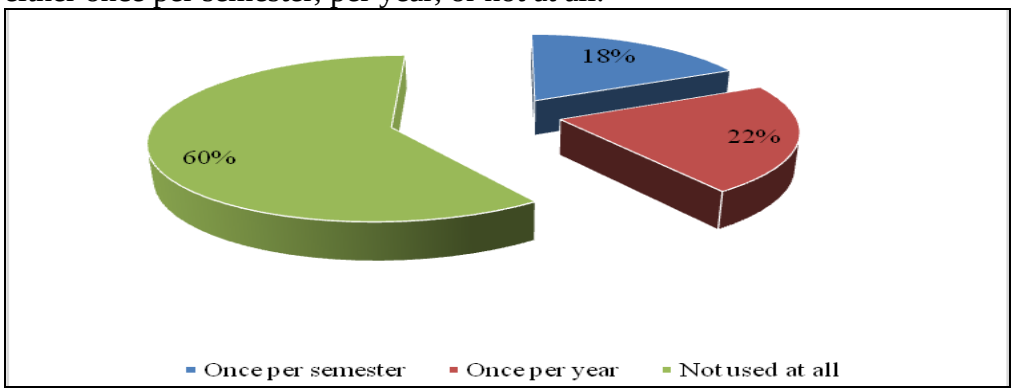

Figure 2: Frequency of portfolio usage

Frequency of practical work usage by Instructors

The research findings revealed that practical work was consistently conducted once weekly, with all respondents from Institution 'A' and 'B' reporting a 100 per cent utilisation rate. It was observed that practical work occurred weekly throughout the entire semester, resulting in multiple practical sessions being conducted per semester.

For instance, instructors indicated the regular conduct of practical work in both Biology and Chemistry courses. However, contrasting responses were noted from undergraduate science students, particularly regarding practical work in chemistry. While practical work in biology was conducted on a weekly basis, students reported that practical work in Chemistry occurred as a single course during the first year. Within this course, nine practical sessions were held covering various areas of Chemistry such as organic Chemistry, inorganic Chemistry, and Physical Chemistry. This suggests that different chemistry fields featured varying weekly practical sessions, unlike Biology.

Furthermore, the findings showed that practical work in Chemistry was concluded once conducted, indicating some summative aspects associated with these sessions.

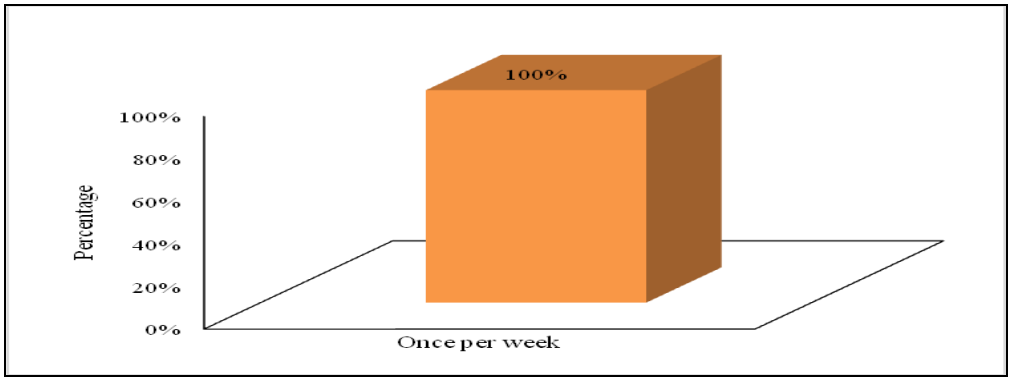

Figure 3: Frequency of practical work usage

Frequency of using teaching practice by Instructors

The findings indicated that 100 per cent of the respondents reported using teaching practices once per year. This suggests that in both higher education institutions, 'A' and 'B', teaching practice was conducted annually, as evidenced in Figure 4. Respondents indicated that teaching practice was carried out once per year after the conclusion of the second semester for first and second-year undergraduate science student-teachers. Both the questionnaire responses and interview data revealed that teaching practice was utilised once per year. Findings indicated a consensus among respondents regarding the frequency of teaching practice.

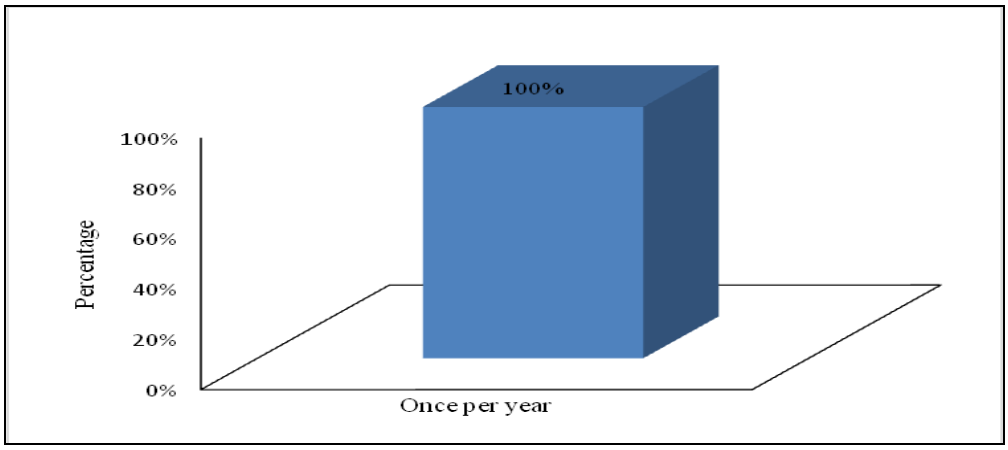

Figure 4: Frequency of using teaching practice

Relationship between authentic assessment tools and Pedagogical Competence

Linearity assumption

Linearity is the assumption of multiple regression, which specifies that the residuals should have a straight–line relationship with the predicted dependent variable score (Pallant, 2016). Linearity is an important assumption due to the fact that it gets rid of the biasness of estimations if is violated (Keith, 2019).

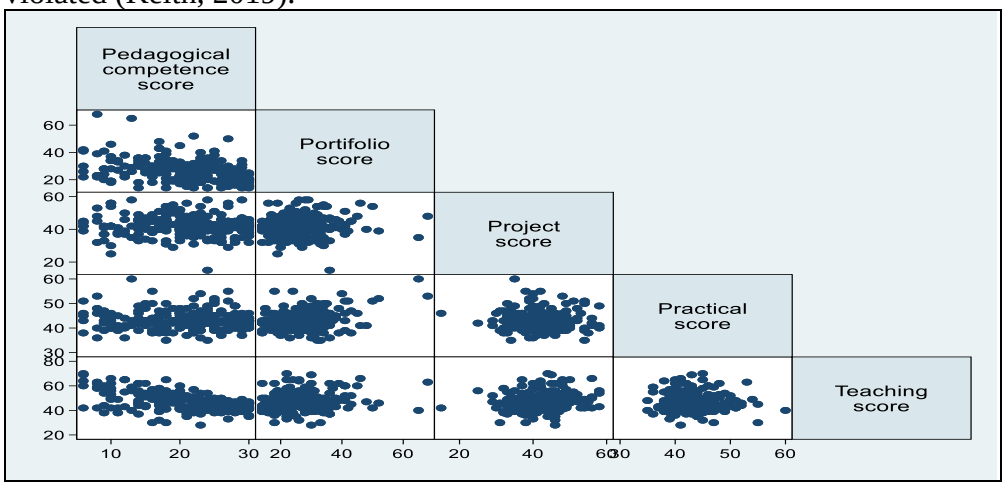

Figure 5: Scatter matrix for pedagogical competence

The scatter matrix was employed to test the linearity assumption. The scatter matrix indicates a linear association between pedagogical competence and tools of authentic assessment (i.e., independent variables) employed in the regression model since all points appearing in the first quadrate were increasingly positive for the relationship between pedagogical competence score and all the independent variables.

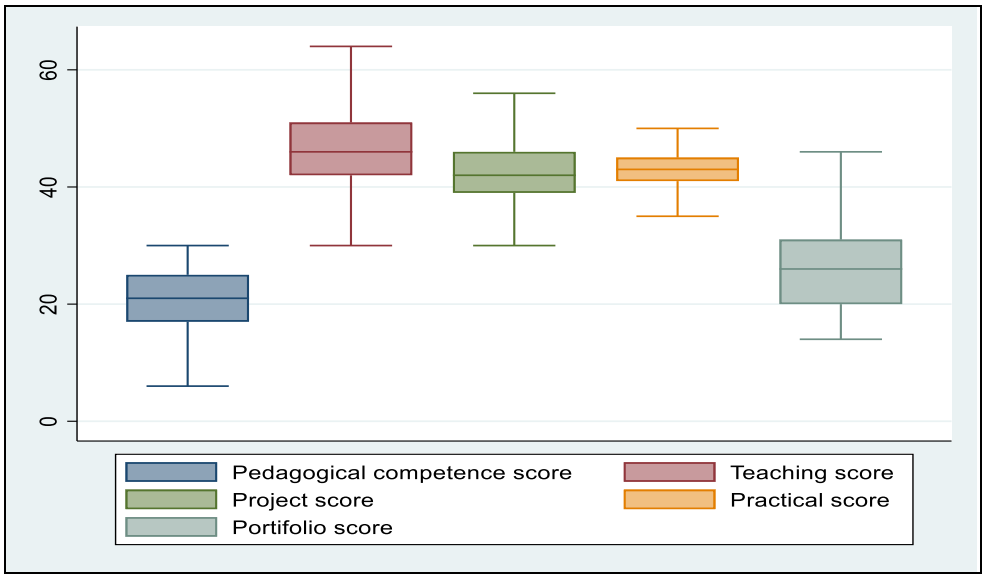

Figure 6: Box plot on tools of authentic assessment and pedagogical competence score

An outlier is a data point that is very high or very low from the rest of the observations in a statistical study. When conducting statistical analysis, an outlier might cause significant complications that may lead to a wrong inference of the results. The box plot indicates that there is no point which is below or above the lower whisker or the upper whisker of the box plot, as indicated in Figure 6. This implies that the pedagogical competence score, as well as the whole score for the tools of authentic assessment, do not have an outlier. Therefore, this means that the findings obtained in the model which involves these variables were not affected by outliers; hence, the findings are valid.

Normality assumption

The test for normality of content competence (dependent variable) was done by use of the Kolmogorov-Smirnov test. Given that H0 and H1, set α=0.05, the rule is that reject H0 if P-value is less than α else fail to reject H0, where:
H0: The data is normal
H1: The data is not normal

Table 2: Test of normality

Variable	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Residual	4.139	231	0.056	5.947	231	0.2065

H_0=Data are normally distributed

H_1=Data are not normally distributed

By using the Kolmogorov-Smirnov test of normality, pedagogical competence data is normal since the P-value, 0.056, is above 0.05 and, thus, we fail to reject the null hypothesis (H0). This implies that the residual values obtained in the model were normally distributed and are purely random. The study, therefore, concluded that the pedagogical competence variable is normal in distribution, and hence, subsequent analysis could be carried out. The dependent variable should be normally distributed because the study was using a multiple linear regression model, where the condition of normality must be satisfied (Pallant, 2016).

Table 3: The Breusch pagan test of heteroscedasticity

Source	**chi2**	**df**	**p**
Heteroskedasticity	3.3	14	0.5378
Skewness	4.76	4	0.2582
Kurtosis	0.57	1	0.9939
Total	8.63	19	0.3962

H0: $\gamma = 0$ The residuals variance is constant (homoscedasticity)

H0: $\gamma > 0$ The residual variance is not constant

P value > 0.05 fails to reject the null hypothesis

There is no heteroscedasticity since the p-value is greater than 0.05. Therefore, this implies that the model is free from the heteroscedasticity problem and that the model is robust.

Table 4: Test of Multicollinearity (i.e., variance inflation factor)

Variable	VIF	1/VIF
Portfolio score	1.15	0.865953
Project score	1.11	0.897793
Practical score	1.06	0.942827
Teaching score	1.04	0.963874
Mean VIF	1.09	

Whenever multiple linear regression is employed, the multicollinearity test is employed to assess if the independent variables included in the model influence one independent variable or another independent variable. The rule of thumb is that there is always severe multicollinearity if the variance inflation factor (VIF) is above 10. VIF should be less than 10 to indicate a lack of multicollinearity (Pallant, 2016). There is no multicollinearity since the VIF for all independent variables was below 10, and the average of all VIFs was also below 10.

Table 5: Relationship between tools of authentic assessment and Pedagogical Competence

Pedagogical competence Score	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Portfolio score	0.221	0.042	5.28	0.000	0.004	1.139	***
Project score	0.027	0.055	0.50	0.620	-0.081	0.135	
Practical score	0.012	0.095	0.13	0.899	-0.174	0.198	
Teaching score	0.401	0.047	8.60	0.000	0.093	2.310	***
Constant	43.579	5.001	8.71	0.000	33.723	53.436	***
Mean dependent var		20.533	SD dependent var			6.190	
R-squared		0.662	Number of obs			227.000	
F-test		31.552	Prob > F			0.000	
Akaike crit. (AIC)		1378.607	Bayesian crit. (BIC)			1395.732	

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

Multiple linear regression was employed to investigate the relationship between tools of authentic assessment and content competence among undergraduate prospective science teachers. The results presented in Table 5 indicate that the independent variables included in the model served as good predictors of pedagogical competence among the undergraduate prospective science teachers. Approximately 66.2 per cent of the variance in pedagogical competence was accounted for by the variations in the explanatory variables incorporated into the model. Furthermore, the collective influence of the explanatory variables in the model significantly impacted pedagogical competence among the undergraduate prospective science teachers ($F = 31.552$, $P < 0.001$).

However, it was observed that the predictor variables, namely practical work score and project score, did not significantly influence pedagogical competence among the undergraduate prospective science teachers in the study area. Conversely, the predictor variables portfolio score and teaching score significantly influenced pedagogical competence among the undergraduate prospective science teachers.

Specifically, the teaching practice score demonstrated a significant influence ($P < 0.001$) on pedagogical competence among the undergraduate prospective science teachers, with a coefficient of 0.041. This indicates that for every one-unit increase in the teaching practice score, the pedagogical competence is expected to increase by 0.041 scores. Thus, a direct proportional relationship exists between teaching practice and pedagogical competence, suggesting that the application of teaching practice positively impacts pedagogical competence.

Similarly, the portfolio score was found to be significant at $P < 0.001$, with a coefficient of 0.221. This implies that for every one-point increase in the portfolio score, the pedagogical competence among undergraduate prospective science teachers would increase by 0.221 scores. Therefore, a positive relationship exists between portfolio utilisation and pedagogical competence, indicating that a higher application of portfolios leads to an increase in pedagogical competence among undergraduate prospective science teachers.

Discussions of the Findings

The findings reveal a diverse landscape regarding the of authentic assessment tools by instructors in higher education institutions (HEIs), with responses varying from weekly, semesterly, and yearly to not at all. Predominantly, the study focuses on four authentic assessment tools: portfolios, projects, practical work, and teaching practice. The analysis suggests a need for increased emphasis on project-based assessments, particularly in Bachelor of Science with Education programs, where competencies in designing teaching materials and research methodologies are pivotal for post-graduation teaching roles. While projects were utilised to some extent, the frequency fell short of optimal levels across various courses.

The observed infrequency, whether annually, semesterly, or non-existent, raises concerns regarding competency acquisition among learners. Particularly noteworthy is the minimal utilisation of projects in biology and chemistry courses, where traditional assessment methods prevail over authentic assessment tools. Even in pedagogical educational courses, where projects were employed for material design, their frequency remained suboptimal, potentially hindering desired competency outcomes. These findings echo existing critiques on graduate weaknesses (Quansah et al., 2019; Thambusamy et al., 2014). Corroborating prior research, the findings align with assertions by Baysura et al. (2016), Benzer and Şahin (2013), and Bhukuvhani et al. (2012), emphasising the sporadic use of projects and portfolios across educational contexts. Notably, portfolios were and underutilised in biology and chemistry courses, signalling a necessity for increased integration.

While collectively, authentic assessment tools significantly impacted pedagogical competencies, variations in their influence were observed. Practical work and project scores displayed minimal influence on pedagogical competence among undergraduate science student-teachers. Conversely, teaching practice and portfolio scores substantially positively influenced pedagogical competencies, indicating their importance in competency acquisition. The positive correlation between teaching practice

and pedagogical competencies aligns with findings by Amankwah et al. (2017) and Hagos et al. (2020), underscoring the role of active engagement in teaching methodologies. Similarly, Kihwele and Mtandi (2020) emphasise the link between teaching practice and pedagogical competence development among prospective teachers.

Portfolios, encompassing document preparation and design, were associated with enhanced pedagogical competencies, particularly in curriculum interpretation and teaching methodology. The observed relationship resonates with the findings by Oudkerk Pool et al. (2020), Iqbal et al. (2021), and Ndihokubwayo et al. (2020), highlighting the role of portfolios in fostering pedagogical competency through active engagement. In summary, while authentic assessment tools collectively contribute to pedagogical competency development, their varied utilisation underscores the need for targeted interventions, particularly in enhancing the frequency and integration of projects and portfolios across educational curricula.

Conclusions

The disparity in the utilisation of authentic assessment tools is apparent. Certain authentic assessment tools were seldom employed or utilised minimally, thereby impacting the acquisition of pedagogical competence among undergraduate science student-teachers. Practical work was administered once per week, while portfolios, projects, and teaching practice were implemented once per semester or year. Despite the correlation between authentic assessment tools and pedagogical competence, the significance of their frequency of use warrants acknowledgement.

Recommendations

Higher Education Institutions (HEIs) should consider formulating comprehensive, authentic assessment policies to offer clear guidance to both students and instructors regarding their implementation. Specifically, these policies should encompass detailed guidelines on the general conduct of authentic assessment and the utilisation of authentic assessment tools within HEIs. Moreover, there should be an emphasis on fostering academic inquiry into the efficacy and implementation of authentic assessment methodologies across diverse disciplines. This entails conducting longitudinal studies, comparative analyses, and qualitative investigations to deepen our understanding of how authentic assessment practices influence student learning outcomes.

References

Adamu, I. A., & Mohammed, H. A. (2022). Teachers' pedagogical competence as a determinant of students' motivation towards business

education in Federal College of Education (Technical) Gombe in North-East Nigeria. *Kashere Journal of Education*, *2*(2), 42–49. https://doi.org/10.4314/kje.v2i2.6

Aliu, J., & Aigbavboa, C. (2021). Key generic skills for employability of built environment graduates. *International Journal of Construction Management*. https://doi.org/10.1080/15623599.2021.1894633

Amankwah, F., Oti-Agyen, P., & Sam, F. K. (2017). Perception of pre-service teachers' towards the teaching practice programme in college of technology education, University of Education, Winneba. *Journal of Education and Practice*, *8*(4), 13–20.

Anoh, J. N. (2021). Impact assessment of pedagogical content perception of biology teaching in schools. *International Journal of Innovative Science and Research Technology*, *6*(4), 1028–1037. www.ijisrt.com

Arlianty, W. N., Febriana, B. W., Diniaty, A., & Fauzi'ah, L. (2017). Designing assignment using authentic assessment. *AIP Conference Proceedings*, *1911*(1), 020016. https://doi.org/10.1063/1.5016009

Ashford-Rowe, K., Herrington, J., & Brown, C. (2014). Establishing the critical elements that determine authentic assessment. *Assessment and Evaluation in Higher Education*, *39*(2), 205–222. https://doi.org/10.1080/02602938.2013.819566

Baysura, Ö. D., Altun, S., & Toy, B. Y. (2016). Perceptions of teacher candidates regarding project-based learning. *Eurasian Journal of Educational Research*, *16*(62), 15–36. https://doi.org/10.14689/ejer.2016.62.3

Benzer, E., & Şahin, F. (2013). The effect of project based learning approach on undergraduate students' environmental problem solving skills. *Elementary Education Online*, *12*(2), 383–400. https://doi.org/10.17051/io.12812

Bhukuvhani, C., Mupa, M., Mhishi, M., & Dziva, D. (2012). Science practical work instructional technologies and open distance learning in science teacher training: A case study in Zimbabwe. *International Journal of Education and Development Using Information and Communication Technology*, *8*(2), 18–19. https://eric.ed.gov/?q=%22practical+work%22+AND+%22science%22 AND%22university+education%22&id=EJ1084176

Çiçek, F. G., & Taşpınar, M. (2021). Subject matter competency perceptions of teacher educators in education faculties of Turkey. *International Education Studies*, *14*(2), 76. https://doi.org/10.5539/ies.v14n2p76

Cohen, L., Manion, L., Morrison, K., & Wyse, D. (2010). A guide to teaching practice. In *A Guide to Teaching Practice*. Routledge. https://doi.org/10.4324/9780203848623

Dahlback, J., Olstad, H. B., Sylte, A. L., & Wolden, A. C. (2020). The importance of authentic workplace-based assessment: A study from

VET teacher education. *International Journal for Research in Vocational Education and Training*, *7*(3), 302–324. https://doi.org/10.13152/ijrvet.7.3.3

De Prada, E., Mareque, M., & Pino-Juste, M. (2022). Teamwork skills in higher education: is university training contributing to their mastery? *Psicologia: Reflexao e Critica*, *35*(1). https://doi.org/10.1186/s41155-022-00207-1

Ellis, C., van Haeringen, K., Harper, R., Bretag, T., Zucker, I., McBride, S., Rozenberg, P., Newton, P., & Saddiqui, S. (2020). Does authentic assessment assure academic integrity? Evidence from contract cheating data. *Higher Education Research and Development*, *39*(3), 454–469. https://doi.org/10.1080/07294360.2019.1680956

Gall, D., Gall, J., & Borg, W. (2003). *Educational research: An introduction* (7th ed.). Pearson Education.

Hagos, A., Halftom, H., Gebrehiwot, K., & Master, A. J. (2020). Prospective teachers towards school-based teaching practice: Perception and challenges. *I-Manager's Journal on School Educational Technology*, *15*(4), 17. https://doi.org/10.26634/jsch.15.4.17060

Iqbal, M. H., Siddiqie, S. A., & Mazid, M. A. (2021). Rethinking theories of lesson plan for effective teaching and learning. *Social Sciences & Humanities Open*, *4*(1), 100172. https://doi.org/10.1016/J.SSAHO.2021.100172

James, L. T., & Casidy, R. (2018). Authentic assessment in business education: its effects on student satisfaction and promoting behaviour. *Studies in Higher Education*, *43*(3), 401–415. https://doi.org/10.1080/03075079.2016.1165659

Joanna, Ł., Katarzyna, J., Anna, D., Paulina, K., Anna, M., Kinga, S., & Anna, M. (2018). Pedagogical competencies of teachers at the beginning of their professional career. *Advances in Social Science, Education and Humanities Research*, *221*, 21–25. https://doi.org/10.2991/ceed-18.2018.5

Johnson, R. B., & Christensen, L. (2014). *Educational research: Quantitative, qualitative, and mixed approaches* (5th ed.). SAGE Publication.

Kafyulilo, A., Rugambuka, I., & Moses, I. (2013). Implementation of competency based teaching in Morogoro Teachers' Training College, Tanzania. *Makerere Journal of Higher Education*, *4*(2), 311–326. https://doi.org/10.4314/majohe.v4i2.13

Keith, T. Z. (2019). *Multiple regression and beyond: An introduction to multiple regression and structural equation modeling* (3rd ed.). Routledge.

Kihwele, E. J., & Mtandi, R. (2020). Impact of teaching practice on pre-service teachers' pedagogical competencies in Tanzania. *East African*

Journal of Education and Social Sciences, *1*(1), 101–111. https://doi.org/10.46606/https://doi.org/10.46606/eajess2020v01i01.0011

Kinay, I., & Bagceci, B. (2016). The investigation of the effects of authentic assessment approach on prospective teachers' problem-solving skills. *International Education Studies*, *9*(8), 51. https://doi.org/10.5539/ies.v9n8p51

Kitta, S. (2004). Enhancing Mathematics teachers ' pedagogical content knowledge. *PrintPartners Ipskamp - Enschede*, 198.

Koh, K., Delanoy, N., Thomas, C., Bene, R., Chapman, O., Turner, J., Danysk, G., & Hone, G. (2019). the Role of Authentic Assessment Tasks in Problem-Based Learning. *Papers on Postsecondary Learning and Teaching*, *3*, 17–24. https://jmss.org/index.php/pplt/article/view/53144

Koludrovic, M., & Ercegovac, I. (2017). Does higher education curriculum contribute to prospective teachers' attitudes, self-efficacy and motivation? *World of Journal of Education*, *7*(1).

Komba, S. C., & Mwandaji, M. (2015). Reflections on the implementation of competence based curriculum in Tanzanian secondary schools. *Journal of Education and Learning*, *4*(2), 73–80. https://doi.org/10.5539/jel.v4n2p73

LeeShing, C., Saat, R. ., & Heng Loke, S. (2015). The knowledge of teaching-pedagogical content knowldge (PCK). *The Malaysian Online Journal of Educational Science*, *3*(3), 40–55.

Lodico, M. G., Spaulding, D. T., & Voegtle, K. H. (2010). *Methods in educational research: From theory to practice* (2nd ed.). Jossey-Bass.

Mcarthur, J. (2020). Student involvement in assessment: Involving the whole student in pursuit of social justice and the social good. *RELIEVE - Revista Electronica de Investigacion y Evaluacion Educativa*, *26*(1), 1–14. https://doi.org/10.7203/relieve.26.1.17089

McArthur, J. (2022). Rethinking authentic assessment: work, well-being, and society. *Higher Education*. https://doi.org/10.1007/s10734-022-00822-y

Mungure, D. M. (2016). An exploration of the preparation and organization of teaching practice exercise to prospective science and mathematics teachers toward improving teaching profession at Morogoro Teachers' College. *Journal of Education and Practice*, *7*(33), 212–220.

Ndihokubwayo, K., Ndayambaje, I., & Uwamahoro, J. (2020). Analysis of lesson plans from rwandan physics teachers. *International Journal of Learning, Teaching and Educational Research*, *19*(12), 1–29. https://doi.org/10.26803/ijlter.19.12.1

Nicol, D., Serbati, A., & Tracchi, M. (2019). Competence development and portfolios: Promoting reflection through peer review. *Competence Development and Portfolios: Promoting Reflection through Peer*

Review., *11*(2), 1–13.

Odumosu, O., & Areelu, F. (2018). Teachers' content and pedagogical knowledge on students' achievement in Algebra. *International Journal of Education and Research*, *6*(3), 83–94.

Olfos, R., & Zulantay, H. (2007). Reliability and validity of authentic assessment in a web based course. *Educational Technology and Society*, *10*(4), 156–173.

Oudkerk Pool, A., Jaarsma, A. D. C., Driessen, E. W., & Govaerts, M. J. B. (2020). Student perspectives on competency-based portfolios: Does a portfolio reflect their competence development? *Perspectives on Medical Education*, *9*(3), 166–172. https://doi.org/10.1007/s40037-020-00571-7

Pallant, J. (2016). *SPSS survivalmanual: A step by step guide to data analysis using IBM SPSS* (6th ed.). McGraw-Hill Education.

Quansah, F., Ankoma-sey, V. R., & Asamoah, D. (2019). The gap between the academia and industry : Perspectives of university graduates in Ghana. *International Journal of Education and Research*, *7*(3), 63–72. http://ijern.com/journal/2019/March-2019/05.pdf

Schneider, R. M., & Plasman, K. (2011). Science teacher learning progressions: A review of science teachers' pedagogical content knowledge development. *Review of Educational Research*, *81*(4), 530–565. https://doi.org/10.3102/0034654311423382

Shulman, L. S. (1987). Knowledge and teaching : Foundations of the new reform. *Harvard Educational Review*, *57*(1), 1–22.

Silveira, J. M., Beauregard, J., & Bull, T. (2017). Development of the Processfolio: Promoting Preservice Music Teacher Reflection Through Authentic Assessment. *Journal of Music Teacher Education*, *27*(1), 11–23. https://doi.org/10.1177/1057083717697632

Singh, Y. K. (2006). *Fundamental of research methodology and statistics*. New Age International (P) Limited Publishers.

TCU. (2021). *Undergraduate admission guidebook for 2021/2022 academic Year*. https://www.tcu.go.tz/sites/default/files/FINAL_Undergraduate_Admission Guidebook Direct Entry 16.09.2021.pdf

Thambusamy, R. X., Singh, P., & Ramly, M. A. (2014). Fit or unfit? perspectives of employers and university instructors of graduates' generic skills. *Procedia - Social and Behavioral Sciences*, *123*, 315–324. https://doi.org/10.1016/j.sbspro.2014.01.1429

Tkatchov, M., U, D., & A. (2022). Authentic assessment in online higher education: Connecting adult learner needs with industry expectations. *Igi-Global.Com*. https://www.igi-global.com/chapter/authentic-assessment-in-online-higher-education/288163

Villarroel, V., Bloxham, S., Bruna, D., Bruna, C., & Herrera-Seda, C. (2018).

Authentic assessment: creating a blueprint for course design. *Assessment and Evaluation in Higher Education*, *43*(5), 840–854. https://doi.org/10.1080/02602938.2017.1412396

Vu, T. T., & Dall'Alba, G. (2014). Authentic assessment for student learning: An ontological conceptualisation. *Educational Philosophy and Theory*, *46*(7), 778–791. https://doi.org/10.1080/00131857.2013.795110

Žerovnik, A., & Nančovska Šerbec, I. (2021). Project-based learning in higher education. In *Lecture Notes in Educational Technology* (pp. 31–57). https://doi.org/10.1007/978-981-16-2082-9_3

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