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Science and mathematics secondary school teachers' awareness and preparedness on the implementation of competence-based assessment: implications for students' soft skills acquisition

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Abstract. Competence-based assessment is a global concern in enhancing 21st-century skills among science students and teachers. The study focused on investigating the awareness and preparedness of secondary school science and mathematics teachers regarding the implementation of competence-based assessment (CBA) for students' acquisition of soft skills. The study employed a mixed-methods research approach with an explanatory sequential design. Data collection methods included questionnaires and interviews. The sample for the study consisted of 100 science and mathematics teachers selected randomly from secondary schools in Iringa Municipality. The study's findings indicated that secondary school science and mathematics teachers were partially aware of competence-based assessment, as they were unable to accurately explain the meaning, uses, and demonstration of understanding of CBA methods. Similarly, the findings indicated that the level of preparedness for the use of CBA among teachers was fair, as most of them were engaged in various professional development programmes. However, the frequency and effectiveness of the professional development programmes were inadequate because, despite being prepared through training, teachers demonstrated minimal understanding of the CBA. The study concludes that secondary science and mathematics teachers had superficial awareness and were partially prepared on the CBA, hence failing to implement such methods due to the ineffectiveness of the training given through the professional development programmes organised. The study recommends that professional development be provided to science and mathematics teachers continuously to make it effective in creating not only awareness but also competence in implementing the CBA.

Keywords: awareness, competence-based assessment, professional development, preparedness, soft skills

1. Introduction

There has been a concern worldwide about the role of competence-based assessment (CBA) in enhancing 21st-century skills acquisition among students [4, 13, 20, 23, 26]. On the one hand, 21st-century skills refer to the soft skills and generic competences that support the hard skills for the daily encounter in the real-life situation [3, 21, 25, 28]. On the other hand, the competence-based assessment enables students to be actively engaged in performing tasks that not only measure learning outcomes but also equip them with skills applicable in the real world. It is the measure that determines the learner's ability to apply the skills learned to the real world [1]. CBA is a learner-centred assessment approach that engages students in preparing and completing tasks. The concern for the scholars has been due to the contribution of CBA to the acquisition of 21st-century skills, namely communication skills, creativity, decision-making, collaboration, teamwork and problem-solving [2, 11, 25]. It is through CBA

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that students acquire 21st-century skills that help them to be employable in the future and master daily encounters. That being the case, the acquisition of 21st-century skills among students through competence-based assessment is of paramount concern.

Scholars have written widely on competence-based assessment in secondary schools [7, 17, 19, 20, 23]. While some scholars have indicated CBA assessment methods proposed by educational authorities to be used to assess students in secondary schools [7, 13]; some have indicated the inadequate use of such methods by teachers [12, 17, 23]. Similarly, other scholars have indicated the minimal use of competence-based assessment methods in favour of traditional paper-and-pen tests and examinations [9, 19, 23]. In addition, some studies have indicated the need for teachers' professional development to enhance their teaching competencies in science and mathematics [18, 22]. For teachers to implement the CBA, the need for competence acquisition and a positive attitude to the teaching profession is important [10]. Furthermore, for the 21st-century, soft skills should be developed among science and mathematics students; teachers should be equipped with anxiety management skills and smart technologies in the educational processes [10, 22]. With the competences acquired by teachers through professional development, students are likely to be well-prepared to face real-life experiences through the acquired competences.

The use of CBA has been noticed to bring positive results in terms of 21st-century skills acquisition [4, 13, 20, 23, 26]; several suggestions have been made for the use of such assessment methods. However, the use of CBA among teachers has varied across schools and individual teachers [16, 24]. Despite studies indicating that the CBA methods commonly used by Tanzanian teachers [9, 19], little is known about the preparedness of teachers and the training provided on the implementation of competence-based assessment. This paper intends to fill the gap of how are secondary school science and mathematics teachers prepared in terms of training on the CBA and implications to the 21st-century skills acquisition among students.

2. Methods

2.1. Research approach and design

The study employed a mixed-methods research approach and an explanatory sequential design. The mixed-methods research approach was used because the researcher is free to employ all possible methods to address a research problem [5]. The concern was to gather information on the use of CBA and the reasons for such use, hence the need for quantitative and qualitative approaches. Creswell and Plano Clark [5] comment that on one hand, explanatory sequential design provides statistical evidence that may be generalised on the relationship between variables (quantitative phase). On the other hand, it provides deeper insights into the experiences and reasons behind the relationship between variables. The quantitative data are collected first, and then, based on the analysed results, qualitative data are later collected for the clarification of questions raised.

2.2. Participants

The study involved secondary school teachers teaching science subjects, namely Biology, Chemistry, Physics, and Basic Mathematics, in Iringa Municipality. The reason for selecting teachers in these subjects is that they are considered challenging in terms of student performance, hence the need to find out how teachers are prepared and trained in the use of competence-based assessment. Studies have indicated that the use of CBA enhances 21st-century skills; hence, there is a need to explore how science teachers acquire these skills. Teachers are the implementers of competence-based assessment; therefore, their involvement was crucial. For this study, a sample of eighty teachers was used as participants. The sample had a representative number of

teachers from four major subjects: Biology, Chemistry, Physics, and Basic Mathematics. First, a purposive sampling technique was employed in all the areas of interest. Then, each discipline was more narrowly defined and chose several teachers who pertained to the specific objectives of the study. After that, the stratified random sampling method was used within each stratum, and participants were selected so that each teacher had an equal chance of selection. This approach ensured that the sample was both relevant and representative at the same time.

2.3. Data collection methods

Questionnaires, interviews and observation were used to collect data. Questionnaires are useful when what is required tends to be fairly straightforward information and not controversial [6]. They also supply standardised answers since all respondents are exposed to the same questions. In this study, the primary concern was to gather data that were not controversial regarding science teachers' preparedness and training. However, data considered controversial were also collected through interviews. Interviews were used because they are a method that is useful for gaining insights into things such as people's opinions, feelings, and experiences [6]. Since competence-based assessment implementation involves feelings and beliefs about how it is implemented, an interview was a suitable method. Observation was used because it stands a better chance of retaining the naturalness of the setting than other social research methods. The observation enabled the identification of the actual competence-based assessment strategies used in the classroom, thereby justifying the teachers' preparedness in training.

2.4. Data analysis and ethical considerations

Quantitative data were computed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistical methods were employed to summarise and describe the data. These included the use of frequencies, percentages, means, and standard deviations to report patterns, trends, and distributions of responses. This approach helped provide a good picture of the overall attitudes, perceptions, and experiences of the respondents as they related to the research questions. Descriptive analysis also helped identify differences between the responses of teachers in the four subject areas: Biology, Chemistry, Physics, and Basic Mathematics.

Qualitative data were analysed thematically, which involved a systematic reading of the responses to identify recurring patterns, ideas, and concepts expressed by the participants. The responses were coded and categorised into themes that reflected the predominant issues emanating from the participants' perceptions. This allowed for an in-depth understanding of the underlying meanings and perceptions of the respondents, offering informative contextual data that complemented the quantitative findings. Through the integration of quantitative and qualitative data analysis techniques, the study was able to triangulate its findings, thereby enhancing the validity and richness of the results.

All ethical matters were taken into account within the framework of this study. First, the researcher was referred to the Iringa Municipal Director by Ruaha Catholic University. Upon introduction, the University issued a clearance letter. This was followed by the Municipal Director granting permission for the data collection exercise to be conducted in the specified schools. Informed consent was obtained from the participating teachers before the data collection exercise. To maintain anonymity, all questionnaires and interviews were conducted without including any personal identifiers that could link them to the respondents.

3. Results

3.1. Awareness of science and mathematics secondary school teachers on the competence-based curriculum

The findings indicated that science and mathematics teachers had a superficial understanding of competence-based assessment, based on the responses; most teachers (84 out of 100) were unable to explain clearly what CBA means when asked to define it (table 1). Similarly, teachers held positive beliefs about the importance of CBA (table 1). The findings indicate that they believed CBA is important in enhancing competencies among students.

Table 1
Awareness of science and mathematics secondary school teachers on the competence-based curriculum.

Item	*N*	Min	Max	Mean	Std Dev
Understanding of science teachers on CBA	98	1	4	1.87	0.727
Define CBA correctly	97	1	2	1.84	0.373
Teachers belief on the importance of CBA	99	1	4	1.23	0.491

This is evidenced by some of the responses to the questionnaires regarding the meaning of competence-based assessment, as provided by the teachers (table 2).

Table 2
Science and mathematics teachers' responses on the definition of CBA.

Teacher	Definition on CBA given
Biology Teacher 1	Competence-based assessment is how the student understands the question, but also is based on student understanding
Physics Teacher 1	Competence-based assessment is an assessment that involves asking questions about what students understand
Physics Teacher 2	Competence-based assessment is the assessment that involves measuring students' ability during the teaching and learning process
Chemistry Teacher 1	Competence-based assessment is the evaluation way that aims at measuring an individual's capacity
Mathematics Teacher 1	Competence-based assessment is the one in which the nature of teaching and learning is focused on a student-centred approach
Chemistry Teacher 2	Competence-based assessment should be based on scenario
Mathematics Teacher 2	Competence-based assessment is based on students' understanding, teaching from known to unknown
Chemistry Teacher 3	Competence-based assessment is based on students' participation during the learning process. The teacher acts as a supervisor only
Chemistry Teacher 4	Competence-based assessment is a student-centred approach
Biology Teacher 2	Competence-based assessment is an assessment done in order to test the general understanding of the student

The findings from the questionnaires are supplemented by the responses based on the interviews as follows:

With regards to the awareness of the meaning and CBA methods used by the science and mathematics teachers, one teacher said:

> …to my understanding, the competence-based assessment is the assessment that describes the cognitive skills of the students. The competence-

> based assessment I commonly use includes formative assessment, self-assessment and summative assessment. (Physics Teacher, School 12, 28/01/2025)

The findings from the teacher indicate a superficial level of understanding of the meaning of CBA, as well as the methods used under CBA. With such a level of understanding, it is unlikely to implement competence-based assessment accordingly, as it is not aware of the nature of tasks that call for the CBA.

Another chemistry teacher had this to say on CBA:

> ... I can define competence-based assessment as an assessment based on an understanding of the students. It is a kind of assessment that prepares learners to understand things and not to cram. The competence-based methods I do use to assess students are tests, examinations and practical work. (Chemistry Teacher, School 5, 30/01/2025)

Based on the teacher's response, it is clear that the understanding and awareness of the CBA are limited in terms of its meaning and methods. The teacher had an understanding that CBA is primarily about tests and examinations, which are still traditional, based on assessment approaches. The interview response clarified the nature of understanding of the science and mathematics teachers regarding the CBA, indicating their partiality to such a concept and its implementation.

3.2. Training received by science and mathematics secondary school teachers on competence-based assessment

The findings indicate that all science and mathematics teachers involved in the study were given formal training on CBA through in-service training. The trainings took various forms, including workshops, seminars, internet-based learning, and in-service training. Furthermore, the findings indicate that the Government of the United Republic of Tanzania, through the Tanzania Institute of Education (TIE), heads of schools, and NGO, were responsible for organising the training on the CBA for science and mathematics teachers. Additionally, the findings indicate that teachers were generally satisfied with the training they received, rating it as effective (table 3).

Table 3
Training received by science and mathematics secondary school teachers on CBA.

Item	*N*	Min	Max	Mean	Std Dev
Training in competence-based assessment	100	1	2	1.05	0.219
Type of training received	99	1	5	2.13	0.765
Who organized the training	94	1	5	2.52	1.171
Level of adequacy of training	99	1	4	1.95	0.691
Frequency of training (professional development)	100	1	4	2.60	0.876
Rating of the training received	100	1	4	1.76	0.571

The frequency of training ranged from once per year in some schools to 2 to 3 times in other schools. The findings indicate that the professional development training was effective in terms of effectiveness. Teachers indicated that they are satisfied with the training provided by government and non-governmental organisations. In cases of competence in using CBA, they indicated being confident in using them based on the training provided.

The qualitative findings also support the quantitative findings on the training received by science and mathematics teachers. For example, one biology teacher, when asked whether has been trained on CBA, said:

> ... in terms of training as a teacher, I have been prepared to use CBA well by being equipped with competences through different ways such as learning through the internet, seminars, trainings and so forth. (Biology Teacher, School 2, 30/01/2025)

Another mathematics teacher commented:

> ... I have been equipped with the CBA skills through practice, you know, always you have to be updated, but also I acquired skills through attending training on CBA organised by the Government or NGO's. (Mathematics Teacher, School 13, 27/01/2025)

The responses of the teachers indicate that they received training on CBA, organised by the Tanzania Institute of Education (TIE), the school management, and non-governmental organisations. Teachers were given awareness of the CBA through in-service training organised at schools.

4. Discussion

The findings indicated that science and mathematics teachers had a limited understanding of competence-based assessment. This means that CBA may not be well assessed in terms of the paradigm shift from a competence-based curriculum due to teachers' partial understanding of how to evaluate it. Similarly, science and mathematics teachers held positive beliefs about the importance of CBA in enhancing students' learning, implying that they placed value on its use. However, the weaknesses were observed in the definition of CBA. Most of the teachers failed to explain the meaning of CBA correctly. This means that they might have heard of the assessment method CBA without a clear understanding of what it entails. If science and mathematics teachers cannot comprehend CBA, it is unlikely that they will use it accordingly. It is clear that for any assessment method to be implemented, stakeholders must understand its meaning. Awareness of the naming and narration of the CBA may not fully indicate that teachers are implementing it. For example, if CBA is defined as a learner-centred approach without specifying the methods involved, the results from its use might be irrelevant. The teacher needs to be familiar with tasks that relate to real-life experiences, such as projects, portfolios, and practical work, in order to design tasks that reflect this orientation. Since science and mathematics teachers often fail to comprehend the meaning and methods used under the CBA, it is unlikely that they will help students acquire essential soft skills, such as communication skills, problem-solving, creativity, decision-making, and innovativeness.

The findings, on the one hand, concur with Mushi, Makwinya and Kalungwizi [19], who found that teachers had a limited understanding of the CBA, despite its use. As seen in this study, teachers who hold a positive belief in the importance of CBA demonstrate a certain level of awareness of this form of assessment. However, the superficiality of the level of understanding might affect how it is implemented. Being aware of a form of assessment called CBA, but not fully understanding its meaning and the nature of tasks assigned to students, is less likely to yield positive results in terms of student learning. On the other hand, the findings are in contrast to Ismail, Shavega and Kigobe [8], Ndomondo [20], Rubeba and Ali [23]. For example, Ndomondo [20] indicated that teachers have inadequate knowledge of CBA in History subjects, so they did not use it as recommended in the curriculum. Likewise, findings by Rubeba and Ali [23] contradict the findings of this study by indicating that some teachers used assessment methods reflecting a content-based approach, hence failing to assess the 21st-century skills which call for the use of CBA.

An inadequate understanding of the CBA is one of the reasons that most examinations, which were traditionally composed and administered to students, were based on it. Furthermore, Ndomondo [20] insisted that teachers were found to be incompetent not only in CBA but also in other assessment practices. That being the case, CBA may be less likely to achieve the expected outcomes in terms of enhancing students' learning and leading to the acquisition of 21st-century soft skills. Based on the cited literature, it can be observed that the use of CBA varies from one region to another, and teachers' understanding ranges from none to moderate. It is therefore noted that, despite the shift from a content-based curriculum to a competence-based curriculum, the mode of assessment remains traditional and does not align with the CBA. Furthermore, science and mathematics teachers demonstrate partial understanding of the CBA, suggesting that they are not adequately positioned to equip students with the 21st-century skills.

In the case of training, although the findings indicate that teachers received training on CBA, the frequency was inadequate in terms of the number of training sessions received. The findings align with the National Framework for Teachers' Continuous Professional Development (NF-TCPD) [27], which emphasises the need for all teachers to participate in in-service training to enhance their content and pedagogical competencies. Although the NF-TCPD insists on continuous teachers' professional development, the findings indicate inadequacy in terms of the frequency of training. The state of good and poor follow-up could be a reason for the above inadequate training among teachers in some schools. Education professionals are supposed to take this training on a routine basis, but in many cases, this does not happen. The supervisory body responsible for ensuring that teachers are properly monitored and trained is not doing so, which may be why there is some failure in training.

The findings concur with Mpate [18], who found inadequate staff training related to the implementation of competence-based curricula in secondary schools. Since students are assessed using CBA, the inadequacy of training in the CBC affects the use of CBA. The point of concern is not the training being given to science and mathematics teachers, but rather the nature and frequency of the training. This means that if the training is organised once per year, it may not be adequate to help teachers become aware of and understand how to use the CBA. Despite the Ministry of Education, Science, and Technology (MoEST) insisting on continuous teacher professional development in the school-based environment, the practice indicates that such training is not being conducted as stipulated. The lack of proper implementation of the policy and directives as given by the MoEST to teachers might affect not only the teaching and learning processes but also might lead to the inadequacy of 21st-century skills among students. The inadequacy of training provided to science and mathematics teachers may be the reason for their superficial understanding of the CBA, which in turn leads to ineffective implementation.

The findings, however, are in contrast to Mushi, Makwinya and Kalungwizi [19] who reported a lack of training conducted to help teachers implement CBA. They comment that teachers were not trained at all in the use of CBA to assess their students. Similarly, Mgaiwa and Milinga [15] indicated that despite the importance of training teachers to carry out their duties effectively, they were rarely trained through professional development programmes. That being the case, it is worth noting that the use of CBA was significantly affected by inadequate or a lack of competencies in its application, which in turn impacted the measurement and acquisition of soft skills. Similarly, Komba and Mwakabenga [14] indicated that teacher professional development in Tanzania is unreliable, thereby affecting the acquisition of teachers' competence through the training provided. This means that teachers were not consistently involved in training to enhance their competencies in competence-based

assessment, so they would be conversant in using this form of assessment.

5. Conclusion and recommendations

Based on the study's findings, it is concluded that despite the professional development programmes provided to science and mathematics teachers on the use of CBA, awareness and preparedness remain superficial. Teachers are aware of the CBA as a form of assessment because they have heard about it from various sources, but they do not have a clear understanding of its use in enhancing students' learning. That being the case, awareness and preparedness among science and mathematics teachers regarding CBA are inadequate, despite the emphasis on the National Framework for Teachers' Continuous Professional Development Policy.

It is recommended that science and mathematics teachers be fully aware of CBA in enhancing students' learning; the professional development through in-service training should be continuous as stipulated in the NF-TCPD. The Government of Tanzania, through the Ministry of Education, Science, and Technology, should prioritise in-service training on CBA throughout the year, with variations in time intervals, using its relevant organs. There should be a follow-up on the implementation of the CBA among teachers in schools for the effective acquisition of 21st-century skills to students. By doing so, science and mathematics teachers may acquire an understanding of CBA in terms of its use to enhance students' learning.

References

[1] Bad, L. and Maliganya, W., 2024. *The Legacy of Mwalimu Nyerere in Leadership and Socio-Economic Development in a New Era of Industrialization: Proceedings of the Second Academic Conference in Commemoration of the Late Mwalimu Julius Kambarage Nyerere, the First President of the United Republic of Tanzania and Father of the Nation, held at The Mwalimu Nyerere Memorial Academy, Kivukoni Campus, Dar es Salaam on 13th October 2023*. The Mwalimu Nyerere Memorial Academy, pp.16–32.

[2] Basri, M., Arif, S., Heryandi and Sinaga, R.M., 2022. Prospective Teachers, Generic Skills, and Student Community Service Program: A Case Study in the Indonesian Context. *WSEAS Transactions on Environment and Development*, 18, pp.80–89. Available from: https://doi.org/10.37394/232015.2022.18.9.

[3] Busaka, C., Kitta, S.R. and Umugiraneza, O., 2022. Exploring Assessment Techniques that Integrate Soft Skills in Teaching Mathematics in Secondary Schools in Zambia. *International Journal of Learning, Teaching and Educational Research*, 21(8), pp.144–162. Available from: https://doi.org/10.26803/IJLTER.21.8.9.

[4] Chacha, J. and Onyango, D., 2022. Challenges Faced by Teachers in Implementing Competence-Based Chemistry Curriculum in Public Secondary Schools in Nyamagana District, Mwanza, Tanzania. *Journal of Research Innovation and Implications in Education*, 6(1), pp.346–358. Available from: https://tinyurl.com/yn3f5rcv.

[5] Creswell, J.W. and Plano Clark, V.L., 2018. *Designing and Conducting Mixed Methods Research*. 3rd ed. SAGE Publications. Available from: https://bayanbox.ir/view/236051966444369258/9781483344379-Designing-and-Conducting-Mixed-Methods-Research-3e.pdf.

[6] Denscombe, M., 2010. *The Good Research Guide: For small-scale social research projects*. 4th ed. McGraw-Hill. Available from: https://www.researchgate.net/file.PostFileLoader.html?id=582a0dbf217e20276533f5a5&assetKey=AS:428404664213506@1479151039119.

[7] Hagenimana, E., Ntawiha, P., Tabaro, C. and Buhigiro, J.L., 2023. Competence-Based Assessment Strategies Applied By Teachers in English Subject: Case of Selected Lower Secondary Schools in Rulindo District, Rwanda. *African Journal of Empirical Research*, 4(2), Dec., p.1353–1360. Available from: https://doi.org/10.51867/ajernet.4.2.136.

[8] Ismail, M., Shavega, T.J. and Kigobe, J., 2024. Competence-Based Assessment in Pre-primary School Classrooms: The Case of Pre-primary Schools in Dar es Salaam Region, Tanzania. *International Journal of Research in Social Science and Humanities*, 5(6), pp.115–123. Available from: https://doi.org/10.47505/ijrss.2024.6.9.

[9] Juma, H. and Patel, G.S., 2024. Competence-Based Assessment in Tanzanian Teacher Education in the Fourth Industrial Revolution: A Comprehensive Analysis. *Journal of Issues and Practice in Education*, 16, pp.200–224. Available from: https://doi.org/10.61538/jipe.v16i.1437.

[10] Karakose, T., Polat, H., Yirci, R., Tülübaş, T., Papadakis, S., Ozdemir, T.Y. and Demirkol, M., 2023. Assessment of the Relationships between Prospective Mathematics Teachers' Classroom Management Anxiety, Academic Self-Efficacy Beliefs, Academic Amotivation and Attitudes toward the Teaching Profession Using Structural Equation Modelling. *Mathematics*, 11(2), p.449. Available from: https://doi.org/10.3390/math11020449.

[11] Karunanayaka, S.P. and Naidu, S., 2021. Impacts of authentic assessment on the development of graduate attributes. *Distance Education*, 42(2), pp.231–252. Available from: https://doi.org/10.1080/01587919.2021.1920206.

[12] Kibga, E.S., Gakuba, E. and Sentongo, J., 2021. Developing Students' Curiosity Through Chemistry Hands-on Activities: A Case of Selected Community Secondary Schools in Dar es Salaam, Tanzania. *Eurasia Journal of Mathematics, Science and Technology Education*, 17(5), p.em1962. Available from: https://doi.org/10.29333/ejmste/10856.

[13] Kigwilu, P.C. and Mokoro, D.K., 2022. Teachers' Assessment Practices in Implementing Competence Based Curriculum in Secondary Schools in Arumeru District of Tanzania. *East African Journal of Education Studies*, 5(2), pp.324–333. Available from: https://doi.org/10.37284/eajes.5.2.792.

[14] Komba, S.C. and Mwakabenga, R.J., 2020. Teacher Professional Development in Tanzania: Challenges and Opportunities. In: H. Şenol, ed. *Educational Leadership*. IntechOpen. Available from: https://doi.org/10.5772/intechopen.90564.

[15] Mgaiwa, S.J. and Milinga, J.R., 2024. Teacher preparation and continuous professional development: A review of 'missing links'. *Social sciences and humanities open*, 10, p.100990. Available from: https://doi.org/10.1016/j.ssaho.2024.100990.

[16] Mgimba, F.B., 2021. *Formative assessment for developing students communicative competences in secondary schools in Tanzania*. Ph.D. thesis. The University of Dodoma, Dodoma, Tanzania. Available from: https://repository.udom.ac.tz/items/4fa7c726-e0e7-4cd9-8450-536275498106.

[17] Mkimbili, S. and Kitta, S.K.R., 2019. The Rationale of Continuous Assessment for Development of Competencies in Tanzania Secondary Schools. *Advanced Journal of Social Science*, 6(1), Jul., p.64–70. Available from: https://doi.org/10.21467/ajss.6.1.64-70.

[18] Mpate, H., 2025. Biology teachers' implementation of the competence based curriculum in Tanzania: challenges and opportunities. *Journal of Biological Education*, 59(1), pp.16–36. Available from: https://doi.org/10.1080/00219266.2023.2282428.

[19] Mushi, C.C., Makwinya, N.M. and Kalungwizi, V., 2025. Secondary school teach-

ers' conception and levels of use of competence-based assessment in Tanzania. *International Journal of Research Studies in Education*, 14(1), pp.51–66. Available from: https://www.researchgate.net/publication/388242856.

[20] Ndomondo, E., 2024. Promoting history subject skills through competency-based assessment in Tanzania rural secondary schools: Teachers' understanding and practices. *Social Sciences & Humanities Open*, 9, p.100876. Available from: https://doi.org/10.1016/j.ssaho.2024.100876.

[21] Nyinge, B., 2024. Examination of the relationship between authentic assessment and generic competencies among undergraduate science student-teachers in Tanzanian universities. *Educational Dimension*, 11, pp.104–115. Available from: https://doi.org/10.55056/ed.707.

[22] Papadakis, S., Kiv, A.E., Kravtsov, H.M., Osadchyi, V.V., Marienko, M.V., Pinchuk, O.P., Shyshkina, M.P., Sokolyuk, O.M., Mintii, I.S., Vakaliuk, T.A., Striuk, A.M. and Semerikov, S.O., 2022. Revolutionizing education: using computer simulation and cloud-based smart technology to facilitate successful open learning. In: S. Papadakis, ed. *Joint Proceedings of the 10th Illia O. Teplytskyi Workshop on Computer Simulation in Education, and Workshop on Cloud-based Smart Technologies for Open Education (CoSinEi and CSTOE 2022) co-located with ACNS Conference on Cloud and Immersive Technologies in Education (CITEd 2022), Kyiv, Ukraine, December 22, 2022*. CEUR-WS.org, *CEUR workshop proceedings*, vol. 3358, pp.1–18. Available from: https://ceur-ws.org/Vol-3358/paper00.pdf.

[23] Rubeba, A.M. and Ali, H.D., 2024. Classroom-Based Formative Assessment Mirroring 21st-century Skills: Experiences from Secondary School Teachers in Dodoma, Tanzania. *Journal of Issues and Practices in Education*, 16(1), pp.12–35. Available from: https://www.ajol.info/index.php/jipe/article/view/277422.

[24] Salema, V., 2017. Assessment practices in secondary schools in Kilimanjaro Region, Tanzania; A gap between theory and practice. *European Journal of Education Studies*, 3(2), pp.130–142. Available from: https://oapub.org/edu/index.php/ejes/article/view/465.

[25] Sultanova, L., Hordiienko, V., Romanova, G. and Tsytsiura, K., 2021. Development of soft skills of teachers of Physics and Mathematics. *Journal of Physics: Conference Series*, 1840(1), p.012038. Available from: https://doi.org/10.1088/1742-6596/1840/1/012038.

[26] Sutarto, H.P. and Jaedun, M.P.D., 2018. Authentic Assessment Competence of Building Construction Teachers in Indonesian Vocational Schools. *Journal of Technical Education and Training*, 10(1), pp.91–108. Available from: https://doi.org/10.30880/jtet.2018.10.01.008.

[27] United Republic of Tanzania. Ministry of Education, Science and Technology, 2020. National framework for teachers continuous professional development. Available from: https://docs.edtechhub.org/lib/MUSAVHQ9.

[28] Virtanen, A. and Tynjälä, P., 2019. Factors explaining the learning of generic skills: a study of university students' experiences. *Teaching in Higher Education*, 24(7), pp.880–894. Available from: https://doi.org/10.1080/13562517.2018.1515195.