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**Students' Perceptions on Culturally Responsive Pedagogy in Science  
Learning in Tanzanian Secondary Schools for Sustainable  
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## Students' Perceptions on Culturally Responsive Pedagogy in Science Learning in Tanzanian Secondary Schools for Sustainable Development



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### Abstract

**Purpose:** Quality education is a vital element in ensuring the sustainable development of a country, and a culturally responsive curriculum is one of the ingredients needed to achieve it. This study explored the extent to which elements of culturally responsive pedagogy have been included in the teaching and learning of science subjects in Tanzanian secondary schools, focusing on students' perceptions of teaching methods and assessment techniques.

**Methodology:** Six secondary schools in Dodoma Region were randomly selected to represent urban and suburban contexts, with 300 Form Three and Four students purposively selected. A concurrent mixed-methods design was used, combining closed-ended items for measurable data with open-ended items for deeper insights into students' perceptions and experiences.

**Findings:** The study found only limited integration of culturally responsive elements in science teaching and learning, particularly in the exploration of students' prior knowledge, collaborative learning, and field-based instruction, while formative and observational assessment practices were more consistently reported.

**Unique Contribution to Theory, Practice and Policy:** The discussion reads these findings critically against current scholarship on culturally responsive pedagogy, Tanzania's ongoing shift to a competency-based curriculum, and the methodological limits of self-report data, situating them within the country's wider effort to close persistent gender gaps in science participation. Practically and for policy, the study recommends that curriculum developers and implementers deliberately embed culturally responsive elements particularly collaborative, dialogic, and field-based learning into the science curriculum to better support sustainable development.

**Keywords:** *Sustainable Development, Pedagogy, Culturally Responsive, Integration, Science Education, Quality Education*

## INTRODUCTION

### Background of the study

Science education for sustainable development is advocated internationally as a means of facilitating positive societal development, allowing people to lead fulfilled lives through access to education (UNESCO, 2021). Stouthart, Bayram, and van der Veen (2025) argue that sustainable education requires all learners to have the knowledge and skills needed to promote sustainable development, which places a responsibility on education stakeholders to improve science education toward that end. Manns, Heiss, Morohashi, and Loupis (2025) similarly argue that educational sustainability needs to include culturally inclusive practices that incorporate local and indigenous knowledge and processes, practices that can and should be built into everyday teaching and learning. Culturally responsive pedagogy is therefore central to science education for sustainable development, and Tanzania's science teaching and learning activities need to reflect this if they are to serve that goal.

### Statement of the Problem

Countries worldwide are seeking quality science education capable of driving sustainable development, and Tanzania is no exception; researchers, curriculum developers, and other stakeholders continue to look for ways to improve the quality of science education toward this end. The United Nations' Sustainable Development Goals advocate that all learners acquire the knowledge and skills needed to promote sustainable development (UNESCO, 2021), and one of the elements considered crucial to that goal is a culturally responsive curriculum (Manns, Heiss, Morohashi, & Loupis, 2025). Te Ava and Page (2020), writing on the Cook Islands, argue that delivering quality education for sustainability requires culturally responsive pedagogy, and that a quality, sustainable science education is one that encourages cultural inclusivity in policy and curriculum practice. Culturally responsive pedagogy plays a similarly crucial role in Tanzanian students' science learning and their capacity to engage meaningfully with socio-scientific issues relevant to their own sustainable development. This study addresses the resulting gap in knowledge: how culturally responsive pedagogy is, and can be, implemented in the teaching and learning of science subjects in Tanzanian secondary schools.

### Purpose of the Study

The purpose of this study was to explore the extent to which elements of culturally responsive pedagogy have been integrated into the teaching and learning of science subjects in Tanzanian secondary schools, with particular attention to students' perceptions of the teaching methods and assessment techniques used, in order to inform curriculum development that supports quality and sustainable education.

## **Objectives of the Study**

### ***General Objective***

To examine the extent to which culturally responsive pedagogy has been integrated into the teaching and learning of science subjects in secondary schools in the Dodoma region, Tanzania.

### ***Specific Objectives***

- To assess students' perceptions of the teaching methods used in science subjects.
- To examine the extent to which culturally responsive assessment techniques.
- To identify the challenges limiting the integration of culturally responsive pedagogy into science teaching and learning in the context of Tanzania's shift to a competency-based curriculum.

## **Research Questions**

- To what extent do the teaching methods used in science subjects reflect elements of culturally responsive pedagogy, as perceived by students?
- To what extent are culturally responsive assessment techniques used in the teaching and learning of science subjects?
- What challenges limit the integration of culturally responsive pedagogy into science teaching and learning within Tanzania's competency-based curriculum reform?

## **LITERATURE REVIEW**

### **Introduction**

This section reviews literature that helps situate the need for a culturally responsive curriculum in relation to the country's sustainable development, beginning with what culturally responsive pedagogy means in the Tanzanian context.

### **Meaning of Culturally Responsive Pedagogy**

The term culturally responsive pedagogy (CRP) has changed over time, and researchers have cautioned that, without proper guidance, education leaders and individual educators can adopt an oversimplified view of what teaching in culturally responsive ways actually requires (Banks, 2016; Bennett, 2001). The term was historically associated with equity pedagogy, teaching that balances curriculum content with the traditions and values of the society in which learners live (Banks, 2016; Bennett, 2001) before Ladson-Billings (1994) and Gay (2000) each began applying closely related ideas in classroom research, under the labels culturally relevant pedagogy and culturally responsive teaching, respectively. Gay's (2000) synthesis of these strands into culturally responsive pedagogy remains the field's most widely used framework, and Ladson-Billings (2014)

later revisited and updated her own formulation to keep pace with how classrooms, and the students in them, had changed.

### **History of Indigenous Knowledge in Tanzanian Education**

Before colonialism, Tanzanian communities relied on indigenous culture, scientific knowledge, and skill to educate people for the development of society. Indigenous knowledge is commonly defined as a form of local creativity, innovation, and know-how that underlies decision-making, forms the content of education in local societies, and serves as a strategic resource for sustainable development (Grenier, 1998). Tanzania's many tribes each developed indigenous scientific knowledge suited to their immediate environment and livelihood pastoral, agricultural, fishing, and other practices including knowledge, skills, values, techniques, and social protections against hunger, disease, and other hardships, transmitted from generation to generation through oral tradition, demonstration, and peer- and adult-led instruction at home and at work. Some of these practices persist in daily community life today.

Colonialism introduced a new, Western scientific and educational system oriented around preparing workers for the colonial administration (Mushi, 2009). The public schooling system was racially segregated: Europeans were trained for senior management, civil service, and the professions; Asians for middle management; and Africans were confined to roles as assistants, teachers, nurses, and medical auxiliaries (Mushi, 2009). The entire system was designed to serve the colonizers' political and economic interests, and students were taught to treat indigenous science as anecdotal, non-quantitative, and unscientific, in favor of imported Western scientific knowledge (Aikenhead & Ogawa, 2007) despite the fact that much of that indigenous knowledge was genuinely useful and simply under-developed rather than invalid.

Tanzanian secondary school students and teachers continue to interact with indigenous knowledge mostly outside the school context, rarely bringing it into the classroom itself (Semali & Mehta, 2012). Semali and Mehta (2012) argue that science education in non-Western countries needs closer examination precisely because indigenous societies' influence on science and technology has frequently been muted, and that Tanzania in particular needs educational reform that foregrounds indigenous knowledge for sustainable development. Schools can play a vital role in producing graduates able to generate knowledge, think creatively, and solve the complex social and economic problems their society will face; this requires science education that produces both scientifically literate citizens and science professionals equipped to address an increasingly complex, technology-driven economy. Reform toward lifelong learning, critical thinking, problem-solving, and collaborative skills is therefore needed, and culturally responsive pedagogy offers one route by which students can gain the scientific knowledge and skills that foster sustainable development.



### **Culturally Responsive Classroom Practices**

In a culturally responsive classroom, teachers and students together create a caring, respectful climate that values students' culture (Perso, 2012). Cultural values to be promoted include critical thinking, social justice, and instruction made meaningful and relevant to students' lives their culture, language, and learning styles. Teachers are expected to hold high academic expectations for all students, build a more collaborative and challenging learning environment away from traditional memorization and lecturing, and build trust and partnership with families, especially those who are marginalized (Lee et al., 2007, as cited in Perso, 2012). Arvanitis (2017) similarly argues that a culturally responsive classroom requires teachers to attend deliberately to cultural diversity and inclusivity: teachers who consistently recognize students' cultural patterns are more likely to encourage students to display their cultural uniqueness in academic skill, sociocultural attitude, and knowledge, and the reverse holds where teachers do not.

Ford and Kea (2009) describe culturally responsive teachers as advocates of student-centred learning who break down barriers to learning and provide the keys that open doors to students' success which requires teachers to be responsive, obligated, and to feel a genuine sense of urgency about student needs. Beyond that, teachers are expected to take responsibility for learning about their students' culture and community, and to examine their own identity, culture, biases, and privilege in order to critically assess and strengthen their own instructional practice (Gay, 2002; Villegas & Lucas, 2002). Culturally responsive teachers work proactively to understand, respect, and meet the needs of students whose cultural backgrounds differ from their own (Ford & Kea, 2009), recognizing that students are simultaneously similar to, and different from, one another. Culturally responsive educators see themselves as agents of social and pedagogical change, intending to nurture that same orientation in their students and help them access and value their own cultural capital while confronting inequality (Gay, 2010). Villegas and Lucas (2002) add that such teachers are expected to counteract inequality through social-justice-oriented work even at the micro level of their own classroom, taking responsibility for making schools more equitable and inclusive, especially for underachieving students.

Harmon (2012) frames the stakes of this work sharply, culturally responsive pedagogy needs to prepare students to change society, not merely to fit into it. This implies that teachers must incorporate elements of students' culture into their teaching rather than treating culturally responsive practice as an add-on (Irvine & Armento, 2001). In culturally responsive teaching, teachers are expected to spend considerable time, in the classroom and outside it, building personal relationships with students and their families, listening to students, and allowing them to share their own stories (Irvine & Armento, 2001) practices this study's questionnaire was designed to test for directly in Tanzanian science classrooms.

## **Theoretical Framework**

This study employed social constructionism, which focuses on the understandings and meanings that emerge from interaction and negotiation among people within a society, cultural group, or community (Gergen, 1985). Young and Collin (2004) argue that meaning is constructed historically and culturally and changes over time, varying from place to place (Burr, 1995). The way Tanzanians understand educational meaning within the curriculum, for example, differs markedly from Western worldviews, even though a legacy of British colonialism survives within the education system. This constructionist approach frames the study's analysis of Tanzanian perspectives on science in the school curriculum, and its focus on how culturally situated issues are integrated and implemented within it.

## **RESEARCH METHODOLOGY**

This study was conducted in the Dodoma region of Tanzania, one of the country's administrative regions and home to the national capital city. The region's main tribes are the Gogo, the Warangi, and the Wasandawe. Dodoma was chosen partly for the cultural diversity it has accumulated since the national government's administrative move from Dar es Salaam, which helped the researchers explore how teachers embrace the different cultures students bring into school and how they support science learning through culturally responsive activities, and partly for researcher accessibility, since all researchers live and work in Dodoma.

Data were collected using a student questionnaire combining open- and closed-ended items to capture both qualitative and quantitative perspectives; open-ended items are generally used to elicit more in-depth data about participants' perceptions, while closed items are used to elicit more clearly factual data (Bird, 2009). Six secondary schools were selected at random, three from urban Dodoma and three from suburban Dodoma following Patton's (1990) guidance that sample size in a study of this kind should be set according to the time and resources available. Quantitative data were analyzed in SPSS, with Microsoft Excel used to organize the data and present summarized findings in tables and graphs, followed by a discussion addressing the quantitative findings in more depth.

## **RESULTS AND DISCUSSION**

### **Introduction**

School curriculum plays a crucial role in equipping students, from a young age, with the skills and knowledge needed for their own and their country's sustainable development (Semali & Mehta, 2012), but a lack of culturally responsive curriculum remains one of the central obstacles to that goal. This section presents the study's findings on the extent to which a culturally responsive curriculum is present in secondary school science teaching in the Dodoma region, followed in each case by a discussion that reads the finding critically against current scholarship.

### Demographic Findings

Tanzanian schools implement the same curriculum in both urban and suburban areas, although local needs sometimes differ by location, which places a premium on teachers' ability to adapt. This study accordingly drew respondents from both urban and suburban secondary schools in the Dodoma region, administering questionnaires to Form III and IV students across six schools, three urban and three suburban.

**Table 1: Respondents' Demographic Data**

| Variable             | Category | Frequency | Percentage (%) |
|----------------------|----------|-----------|----------------|
| School location      | Urban    | 150       | 50.0           |
|                      | Suburban | 150       | 50.0           |
| Stream               | Science  | 213       | 71.0           |
|                      | Arts     | 87        | 29.0           |
| Sex of respondents   | Male     | 129       | 43.0           |
|                      | Female   | 171       | 57.0           |
| Class of respondents | Form III | 168       | 60.0           |
|                      | Form IV  | 132       | 40.0           |

**Source:** Field Data, 2025

A total of 300 questionnaires were obtained from the six schools, administered in equal numbers across urban and suburban locations. The majority of respondents (213) were students from the science stream, with 87 from the arts stream, who were included because biology is a compulsory subject for arts-stream students as well.

The even urban–suburban split strengthens the claim that these findings represent Dodoma region broadly rather than one school type, but it also means the data say little about the more remote rural secondary schools that make up a large share of Tanzania's total enrolment. Vavrus and Bartlett (2012) found that rural and urban students in Tanzania continue to face overcrowded classrooms, inadequate textbooks, and low or inadequate access to quality science education, with these barriers disproportionately affecting the implementation of STEM instruction.

Two further patterns deserve closer scrutiny than a purely descriptive reading gives them. First, girls made up 57% of respondents against 43% boys, and 71% of respondents were in the science stream. Read alone, this could suggest girls are well represented in Dodoma secondary science classrooms. Read against current national evidence, the picture is more complicated: Matete (2022) shows that women's progression into Tanzanian STEM higher education, including science-related teaching fields, remains constrained by socio-cultural and psychological barriers



including a lack of functioning laboratories that limits practical science instruction and a lack of confidence among female students pointing to persistent under representation in the science teaching workforce.

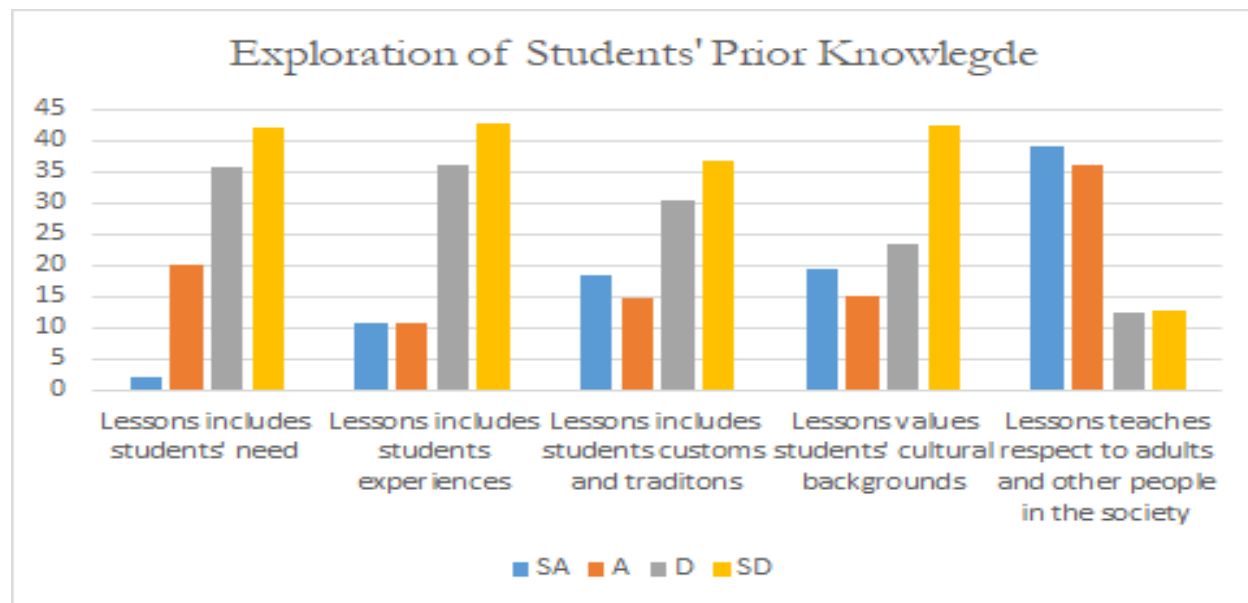
A plausible reading is that girls are reasonably well represented at this secondary stage but that this early parity does not yet survive the transition into STEM specialization, consistent with global evidence that the STEM “leak” for girls widens at later, not earlier, stages of education. Second, the study collected sex and stream data for every respondent but never used them to disaggregate the teaching-method or assessment findings that follow; given the gendered patterns documented elsewhere in Tanzanian STEM (Matete, 2022), boys and girls, or science- and arts-stream students, may well be experiencing culturally responsive practices differently, and the study's headline conclusion about “little integration” of culturally responsive pedagogy should be read as an average across groups whose classroom experiences this design cannot distinguish.

### **Teaching Methods**

Harmon (2012) argues that culturally responsive pedagogy needs to prepare students to change society rather than merely fit into it, which implies that teachers must incorporate elements of students' culture directly into their teaching (Irvine & Armento, 2001). This study explored the extent to which Tanzanian secondary science teaching reflects that expectation.

### ***Exploring Students' Prior Knowledge***

In culturally responsive teaching, teachers are expected to spend considerable time, in the classroom and beyond it, building personal relationships with students and their families, listening to students, and allowing them to share their own stories (Irvine & Armento, 2001). Students' views on whether teachers draw on their prior knowledge, experience, customs, and cultural background were explored across four related items. The findings are indicated in Figure 1.

**Figure 1: Exploration of Prior Knowledge**

**Source:** Field Data, 2025

The findings show that 78% of students disagreed that their needs are included in lessons, against 22% who agreed; 78.7% disagreed that lessons include their own experience, against 21.4% who agreed; 67% disagreed that lessons include their customs and traditions, against 33% who agreed; and 65.6% disagreed that their cultural background is explored during teaching and learning, against 34.3% who agreed. The one item that broke this pattern concerned respect: 75% of students agreed that lessons include training in respect for adults and others in society, against 25% who disagreed.

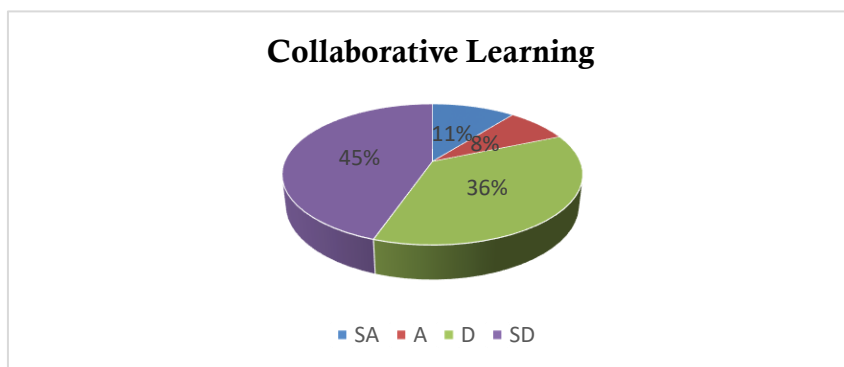
The consistency of the pattern across the first four items roughly three-quarters of students disagreeing that their needs, experience, customs, or cultural background are drawn into lessons is striking, and it is consistent with, rather than contradicting, current international scholarship on the gap between endorsing culturally responsive pedagogy and actually practising it. Franco et al. (2024), in a systematic review of how culturally responsive practice is measured in PK–12 classrooms, found that teachers frequently report valuing students' cultural backgrounds in principle while classroom-level measures of actual practice tell a much less consistent story exactly the split this study's data show between the aspirational language surrounding Tanzania's curriculum reforms and what students report actually happening in science lessons. In the Tanzanian case specifically, this gap has a clear historical root. Aikenhead & Ogawa (2007) and Mushi (2009) both trace the tendency to treat local, indigenous knowledge as unscientific back to the colonial-era curriculum, which was designed to serve colonial administrative needs rather than local ones. That inherited orientation, combined with an examination-driven system that rewards content coverage over dialogue (Fomunyan & Teferra, 2017), offers a more complete explanation

for the finding than teacher indifference alone. The one item that broke this pattern 75% of students agreeing that lessons include respect for adults and others in society is worth reading critically rather than as evidence of successful cultural integration: respect for elders and authority is transmitted pervasively through Tanzanian schooling as a disciplinary and moral norm, not necessarily through the deliberate, content-level cultural integration that culturally responsive pedagogy calls for (Villegas & Lucas, 2002). This item may therefore be picking up the general socializing function of schooling rather than evidence that science lessons specifically have become more culturally responsive.

### ***Collaborative Learning***

Collaborative learning, an umbrella term covering cooperative learning, group discussion, and peer teaching involves joint intellectual effort, individual accountability, positive interdependence, and strong interpersonal skill between students and teachers (Vaughn et al., 2011), and is considered a key component of culturally responsive teaching because it lets participants share and learn from collective experience in a way that mirrors how Tanzanian communities characteristically address challenges together (Juma, 2015). The findings are presented in the figure 2.

**Figure 2: Collaborative learning**



**Source:** Field Data, 2025

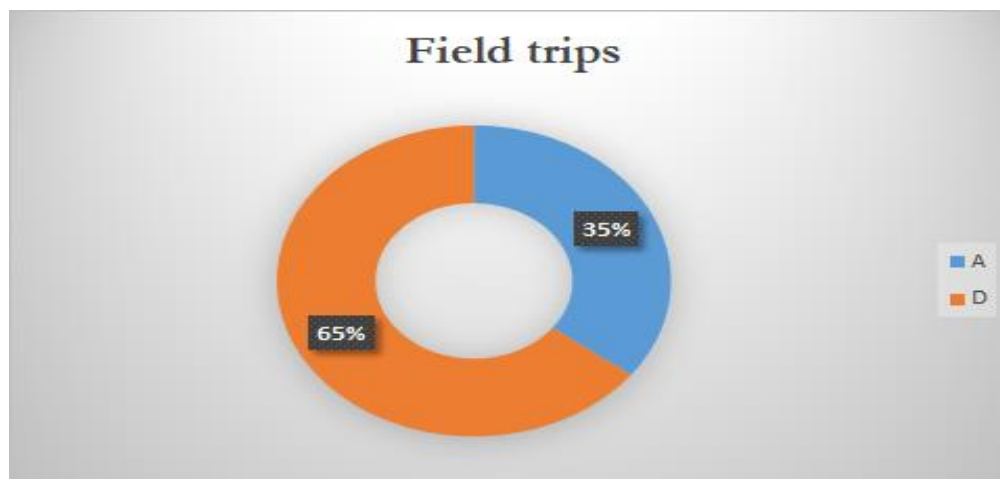
The findings in figure 2 show that 81% of students reported not being involved in collaborative learning activities during their science lessons, against 19% who reported being involved; where group work did occur, it more often took the form of group discussion than peer or cooperative learning specifically. That only 19% of students reported being involved in collaborative learning is a genuinely striking finding, because it runs directly against the theoretical case for including it: if Tanzanian society characteristically works through collective problem-solving, a culturally responsive science pedagogy would be expected to mirror that collectivist orientation through group-based, dialogic instruction (Vaughn et al., 2011; Vygotsky, 1978). The near-absence of collaborative learning in the data therefore represents more than a pedagogical gap, it is a direct contradiction between a cultural value the curriculum is meant to reflect and the individualized, teacher-centred instruction students report actually experiencing. This mismatch is consistent with

broader evidence on Tanzania's ongoing shift to a competency-based curriculum, which documents that teachers frequently lack the training, time, and classroom conditions needed to shift from transmissive to collaborative methods even where policy explicitly calls for it (Nyoni, 2023). Read this way, the finding is less a verdict on Tanzanian science teachers' values and more a symptom of an implementation gap in a reform that, at the time of data collection, was only beginning to take hold nationally.

### ***Field Trips***

Field trips are a major constructivist, student-centred and student-directed method through which learners engage through participation and observation, and can be used to integrate culturally responsive activities into science teaching. Figure 3 explained the students' responses to their opportunity to attend field trips, which enhanced a culturally responsive curriculum.

***Figure 3: Field trips***



***Source: Field Data, 2025***

The findings show that 65% of students disagreed that they had the opportunity to take part in culturally relevant field trips, against 35% who agreed, indicating that most had not been taken by their teachers to different places to learn in a culturally responsive manner. This finding should be read primarily through a resourcing, rather than an attitudinal, lens. Current systematic evidence on outdoor and field-based learning shows real benefits for engagement, social-emotional development, and more unevenly academic outcomes (Mann et al., 2022), which strengthens the case for treating field trips as pedagogically valuable rather than a supplementary extra. At the same time, the same evidence base is explicit that outdoor learning's benefits are conditional on schools being able to fund transport, staff time, and site access exactly the kind of infrastructure least reliably available in under-resourced secondary schools. The finding is therefore double-edged. It confirms that most students are missing a form of learning shown elsewhere to support engagement and cultural relevance, but it does not, on its own, indicate that Tanzanian science

teachers lack interest in field-based, culturally grounded teaching. The more actionable implication is that expanding field-trip access is partly a curriculum-design question and partly a school-financing one, and the two need to be addressed together rather than treating low field-trip participation as a simple pedagogical shortfall.

### Assessment Techniques

Assessment within the African context has tended to take a Western coloration since the introduction of Western education by European colonizers. This study explored whether teachers use any cultural aspect to assess learners' development, treating this as an important and potentially beneficial dimension of culturally responsive pedagogy.

**Table 2: Students' views about teachers' inclusion of cultural aspects in assessment**

| S/N | ITEM                                                                                                     | AGREE       | DISAGREE    |
|-----|----------------------------------------------------------------------------------------------------------|-------------|-------------|
| 1.  | Teachers give students feedback on classroom activities.                                                 | 185 (61.7%) | 115 (38.3%) |
| 2.  | Teachers use multiple ways to allow students to show their competencies.                                 | 140(46.7%)  | 160(53.3%)  |
| 3.  | Students are given specific feedback to achieve their goals.                                             | 112(37.3%)  | 188(62.7%)  |
| 4.  | Teachers use information from formative assessment to help students.                                     | 241(80.3%)  | 59(19.7%)   |
| 5.  | Teachers use observation methods to assess their students to see if they have mastered the lessons.      | 220(73.3%)  | 80(26.7%)   |
| 6.  | Teachers use outdoor activities for students to practice what they teach theoretically in the classroom. | 149(49.7%)  | 151(50.3%)  |

**Source:** Field Data, 2025

Most respondents (61.7%) agreed that teachers give feedback on classroom activities, while 38.3% disagreed. On multiple means of demonstrating competence, 46.7% agreed that teachers allow this, against 53.3% who disagreed, suggesting that only a minority of teachers give learners varied ways to show what they have learned. On specific, goal-directed feedback, only 37.3% agreed that they received it, against 62.7% who did not a gap the study does not treat as negligible, since nearly half of learners across the schools visited were not being given the individualized feedback that could help them progress. By contrast, 80.3% of respondents agreed that teachers use information from formative assessment to help them learn, and 73.3% agreed that teachers use observation methods to assess mastery of a lesson, both suggesting a stronger presence of traditional, culturally grounded assessment approaches than the earlier items imply. Finally, on outdoor, practice-based assessment, 49.7% of respondents said they had been taken outdoors to practice what they learned theoretically, against 50.3% who had not, a near-even split that echoes the field-trip finding above.



The assessment data present a more internally inconsistent picture than the teaching-method data, and that inconsistency is itself the most interesting finding in this section. On one hand, majorities of students agreed that teachers use formative assessment and observation-based assessment to support learning, both practices with long-standing roots in Tanzanian and other indigenous pedagogical traditions, where a more knowledgeable person's ongoing observation of a learner's practical competence has always been a primary way of assessing skill. On the other hand, fewer than half of students agreed that teachers use multiple ways for them to demonstrate competence or give them specific, goal-directed feedback.

Current work on culturally responsive assessment helps explain why this split matters rather than cancelling out: contemporary reviews of culturally responsive classroom practice stress that formative and observational assessment are necessary but not sufficient for cultural responsiveness, what determines whether an assessment is genuinely responsive is whether it also offers flexibility in how a student is allowed to demonstrate understanding, and whether feedback is specific enough to be usable (Franco et al., 2024). By that standard, Tanzanian science teachers in this sample appear to be practicing a partial, rather than a full, version of culturally responsive assessment: they observe and adjust instruction informally, but have not yet extended that responsiveness into offering students varied response formats or individualized feedback pathways. The near-even split on outdoor, practice-based assessment mirrors the field-trip finding above and is best read as a further sign of the same resourcing constraint rather than a separate pedagogical issue: practical, outdoor demonstration of competence depends on time, space, and materials that only some schools in the sample were able to provide consistently.

### **Cross-Cutting Critical Discussion**

Taken together, the discussion sharpens rather than softens the study's original concern. If science lessons rarely draw on students' prior knowledge and rarely link classroom science to the real world of their lives (Semali & Mehta, 2012; Mkimbili & Kayima, 2022). The study indicate that rarely collaborative methods that mirror how Tanzanian and other African communities characteristically build and share knowledge together are employed (Juma, 2015; Mthimkhulu, 2024). The study inconsistently give students varied ways to demonstrate what they know, and only inconsistently give students varied ways to demonstrate what they know, with a persistent gap between the assessment-for-learning practices teachers say they value and what they implement in the classroom, even as competence-based curricula call for change (Ali & Mjenda, 2024). In this situation, students are more likely to be prepared for passing high-stakes examinations than for applying scientific reasoning (Kinyota & Kajungu, 2024) to the sustainable-development challenges, environmental, agricultural, and public-health, that they will actually face in their own communities (Ministry of Education, Science and Technology, 2024). Broader scholarship on indigenous knowledge and education for sustainability makes the same point from a different angle: sustainability-oriented science education works best when it treats local and indigenous ways of

knowing as a genuine resource for scientific reasoning rather than folklore to be corrected (Zidny, Sjöström, & Eilks, 2020).

## CONCLUSION AND RECOMMENDATIONS

This study set out to establish the extent to which culturally responsive pedagogy is integrated into science teaching and learning in Tanzanian secondary schools, and found that integration remains limited and uneven: strongest around traditional, observation-based assessment, and weakest around collaborative learning, field-based instruction, and the deliberate elicitation of students' prior knowledge, experience, and cultural background. Read critically, this pattern reflects an unfinished transition, shaped by a still-visible colonial curricular legacy, an examination-driven system, and the early, resource-constrained stage of Tanzania's competency-based curriculum reform rather than a simple absence of teacher interest or cultural awareness.

The study recommends that the government, curriculum developers, and school leaders take deliberate steps to embed collaborative, dialogic, and field-based learning into the science curriculum, rather than leaving their presence to individual teachers' discretion and resourcing; that professional development explicitly build teachers' capacity to elicit and use students' prior knowledge and cultural background as a resource for science instruction, following models already being tested elsewhere in Africa (Mkhwebane, 2024); that assessment reform pair the formative and observational practices already common in Tanzanian classrooms with more flexible response formats and more specific, individualized feedback, consistent with current culturally responsive assessment scholarship (Franco et al., 2024); and that future research disaggregate findings by gender and stream, and triangulate student perception with teacher interviews and classroom observation, to test whether the gap identified here reflects an absence of practice or, in part, a gap between what teachers believe they are doing and what students notice. Culturally responsive pedagogy, integrated effectively into the Tanzanian science curriculum, remains an important component of the quality education needed to help students acquire the knowledge and skills that will support sustainable development in their own lives and their society.

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