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RESEARCH ARTICLE

The power of teachers' portfolios on planning physics lessons: evidence of authentic assessment

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ABSTRACT

This study examined the power of teachers' portfolios on planning physics lessons as a form of authentic assessment in public secondary schools in Moshi District Council, Tanzania. A convergent mixed-methods approach was applied using the Reflective Practice Theory (RPT). The study targeted 2830 individuals, including school heads, physics teachers, students, and District School Quality Assurance Officers. Sampling methods included simple random, stratified random, and expert sampling, yielding 363 respondents. Assessment experts ensured validity, while reliability was confirmed using Cronbach's alpha (0.84 for teachers and 0.79 for students). Trustworthiness was established through peer debriefing and triangulation. Quantitative data were analyzed using percentages, frequencies, and mean scores, while qualitative data underwent thematic analysis. The study revealed that while teachers prepare portfolios, poor organization and limited accessibility hinder effectiveness. It was concluded that teacher portfolios are powerful assessment tools that provide evidence of students' learning. The study recommends improving portfolio organization to better track student learning and provide constructive feedback for improved teaching outcomes.

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1. Introduction

The integration of teachers' portfolios in educational practices has gained significant attention worldwide as a way to enhance teaching effectiveness and improve student learning outcomes. Portfolios serve as reflective tools that allow educators to document their teaching strategies, assess their effectiveness, and plan future lessons. Research shows that portfolios promote reflective practice, which is essential for ongoing professional development among educators (Aras, 2021). This reflection helps teachers identify strengths and weaknesses in their instructional methods, leading to better teaching approaches and increased student engagement.

In Africa, however, the adoption of portfolio-based assessment practices faces several challenges. Most countries struggle with issues such as limited resources, inadequate teacher training, and a lack of supportive policies that encourage reflective practices in education. Despite these barriers, research highlights the potential of portfolios to support professional development and enhance educational outcomes. Studies indicate that portfolios do encourage critical reflection, allowing teachers to evaluate their teaching methods and adapt them to meet the diverse needs of their students (Beka & Kulinxha, 2021).

In East African countries, concerns have been raised regarding the effectiveness of teachers and the use of portfolios in improving assessment practices in science subjects, particularly in public schools. In Kenya, large class sizes significantly affect teachers' abilities to engage in reflective practices and develop portfolios effectively (Mutuku et al., 2019; Omolo & Simatwa, 2019). Similarly, in Uganda, teachers struggle with a limited understanding of portfolios, leading to inconsistencies in content, organization, and evaluation (Bakaira, 2023). These challenges hinder their professional growth and ability to enhance their teaching practices. Additionally, external factors such as overcrowded classrooms, diverse student needs, and heavy

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workloads further restrict teachers' capacities to engage in reflection and maintain comprehensive portfolios. Moreover, the limited awareness of portfolios as a reflective tool among physics teachers prevents them from critically assessing and refining their instructional strategies, ultimately diminishing the impact of portfolio-based assessment on physics teaching and learning (Dusabimana & Mugabo, 2022; Owino, 2022).

In 2012, Tanzania, through the Institute of Education (TIE), introduced a curriculum framework aimed at enhancing secondary education by emphasizing practical skills and competencies (Komba & Shukia, 2023). This framework promotes the use of various teaching and assessment strategies to support student learning. Similarly, the 2014 Tanzania Education and Training Policy (ETP) underscores the significance of developing student competencies through diverse instructional methods and flexible assessment approaches (Msamba et al., 2023). In the year 2021, The National Examinations Council of Tanzania (NECTA) also issued assessment guidelines (The United Republic of Tanzania (URT), 2021); however, traditional assessment methods discouraged by NECTA remain deeply ingrained, making teachers hesitant to adopt new approaches. Despite these initiatives, many educators still struggle to grasp the importance of incorporating portfolio-based assessment feedback to enhance physics instruction in secondary schools. Government efforts to promote reflective teaching practices have been met with resistance, as teachers continue to rely on outdated lecture-based methods, contributing to persistently low student performance, especially in physics (Komba & Shukia, 2023).

Public secondary schools in Moshi District Council struggle with low student performance in physics, despite policies promoting innovative teaching and assessment methods. The National Examinations Council of Tanzania emphasizes the need for effective assessment tools, but the use of reflective portfolios remains limited. Teachers face difficulties in organizing and maintaining portfolios, hindering their ability to provide constructive feedback and adjust teaching strategies. The lack of clear guidelines on portfolio development adds to the challenge, causing uncertainty about their structure, content, and application. As a result, portfolios are inconsistently implemented, reducing their effectiveness in professional growth and student assessment. However, awareness of their benefits is increasing. Portfolios can help teachers reflect on their teaching, identify areas for improvement, and enhance lesson planning (Adediwura et al., 2020). They also serve as valuable professional development resources, allowing educators to document progress and share insights (Nguyen, 2021). If properly implemented, portfolios could improve student engagement and performance in physics.

2. Statement of the problem

The consistently low performance of physics students in public secondary schools in Moshi District Council raises concerns about the effectiveness of teaching strategies, particularly the use of portfolios. Educators, parents, and school administrators are dissatisfied with the limited use of portfolios as reflective tools in lesson planning. Despite policies advocating innovative teaching approaches, inconsistent implementation has hindered student engagement and academic progress (Komba & Shukia, 2023; The United Republic of Tanzania (URT), 2021). Teachers struggle with organizing and accessing their portfolios, reducing their effectiveness in lesson planning and addressing diverse student needs. If unaddressed, these challenges could further decrease student interest and achievement in physics, worsening educational difficulties in the region (Dusabimana & Mugabo, 2022). Research highlights that well-structured portfolios are essential for providing constructive feedback and improving teaching methods (Adediwura et al., 2020). This study explores how structured portfolios can enhance physics lesson planning and improve learning outcomes in Moshi District Council schools.

3. Research question

This research study sought to answer the following question: How do teacher portfolios help in planning, teaching, and learning physics in Moshi District Council, Tanzania?

4. Significance of the study

The findings of this study are anticipated to offer valuable insights to school administrators, physics teachers, and students regarding the effective use of teacher portfolio feedback to enhance future lesson planning. By fostering better alignment between instructional materials and teaching strategies, the study will encourage physics teachers to document their practices more deliberately. Additionally, the results will help administrators assess and support physics teachers, guiding professional development initiatives. Ultimately, this study will deepen the understanding of how reflective practices can improve teaching effectiveness and contribute to the existing literature on teaching portfolios in public secondary schools in Moshi District Council, Tanzania.

5. Theoretical framework

This research is grounded in the Reflective Practice Theory (RPT) developed by Donald Schön in the 1980s. RPT emphasizes the importance of critically examining one's experiences, actions, and beliefs to enhance professional practice and facilitate continuous learning and development. It encourages individuals to reflect systematically on their thoughts, emotions, and behaviors in relation to their professional responsibilities. Engaging in reflective practice helps professionals gain insights into their decision-making, problem-solving, and overall performance, allow-

ing them to identify strengths and weaknesses while developing new perspectives for improvement.

RPT is particularly relevant to this study as it aligns with the purpose of a teacher's portfolio, enabling educators to evaluate their teaching strategies, instructional methods, and student learning outcomes. By using portfolios, teachers can assess their performance, pinpoint areas for improvement, and adapt their teaching practices to enhance student learning, serving as a vital tool for monitoring their professional growth. The theory promotes self-awareness and self-reflection, providing a structured approach for ongoing learning and career advancement while encouraging critical analysis of personal experiences and beliefs (Anand & Gangmei, 2023). However, the theory's reliance on subjective interpretation and the time and effort required for effective reflection are perceived as limitations, potentially leading to bias and affecting the objectivity of the reflection process, as well as posing challenges in its implementation (Tan, 2020).

6. Review of empirical studies

This review examines how teacher portfolios facilitate reflection on teaching strategies, highlighting their impact on planning effective physics lessons.

Zulfqar and Javaid (2021) conducted a study in Punjab, Pakistan, on the benefits of planning in teaching and learning as perceived by school teachers. Using a descriptive survey design, the study sampled 397 teachers from 43 schools through a multistage cluster technique. Data were collected using an 18-statement self-designed questionnaire on a 5-point scale and analyzed through descriptive and inferential statistics. The findings highlighted that planning significantly aids in content delivery, achieving learning outcomes, managing student activities, organizing resources, and enhancing teaching quality. However, the study's validity was questioned as it relied solely on questionnaires, limiting triangulation and reducing the reliability of findings. Since aspects like perceptions, attitudes, and feelings cannot be fully measured through questionnaires alone, the current study incorporated interviews, observations, and document analysis to improve data validity. This approach aimed to provide a more comprehensive understanding of how teacher portfolios contribute to planning and teaching physics in public secondary schools in Moshi District Council.

Innocent (2021) conducted a study in Nigeria on the impact of effective planning on teaching and learning among secondary school students. Using a descriptive survey design, the study targeted all secondary schools in Ethiope West Local Government Area of Delta State. A sample of 300 teachers from 20 schools was selected through simple random sampling. Data were collected using a questionnaire, with reliability assessed through a test–retest method, yielding a coefficient of 0.74. The analysis involved percentages, means, standard deviations, and a t-test at a 0.05 significance level. The findings showed that effective planning positively influenced teaching and learning, with a significant relationship between planning and student academic performance. However, the study provided limited insights into teacher portfolio creation, content selection strategies, and the role of feedback in improving instruction. To address this, the current study investigated how teacher portfolios contribute to planning and teaching physics in public secondary schools in Moshi District Council.

Nyirahagenimana et al. (2022) conducted a study in Rwanda to evaluate the use of the 5Es instructional model in teaching physics in secondary schools. Using a quantitative research approach, the study focused on six advanced-level physics teachers from four schools in the Rwamagana district, selected through purposive sampling. Classroom observations were used for data collection, and descriptive statistics were used to analyze the findings. Results showed that after training on the 5Es model, teachers improved in integrating engaging activities, using discrepant events, employing visualization guides, and enhancing student confidence. The study highlights the model's effectiveness but lacks details on how teacher portfolio planning influences content selection and instructional material use. Additionally, the purposive sampling method limited the study's quantitative rigor. Given these gaps, further research was conducted to assess the role of teacher portfolios in planning physics instruction in public secondary schools in Moshi District Council.

Mboko et al. (2023) conducted a study in Kenya on the influence of teacher planning on students' academic performance. The study examined how the use of professional documents affected teachers' instructional practices. Using a combination of purposive and stratified random sampling, the researchers targeted 98 principals, 960 teachers, and 6540 students from public secondary schools. A sample of 274 teachers, 364 students, and 29 principals was selected. Data were collected through a standardized questionnaire and analyzed using descriptive statistics, percentages, and regression analysis. The study found that effective teacher planning was essential for successful teaching and learning. It highlighted the role of professional documents but did not specify the types used. Given this gap, further research was conducted to assess the role of teacher portfolios in planning physics instruction in public secondary schools in Moshi District Council.

Nsengimana et al. (2022) conducted a study in Tanzania to assess the satisfaction of science school subject teachers and leaders in Rwanda on the continuous professional development through online learning. The target population included 40 biology teachers and 160 students. Data collection was conducted through interviews and lesson observations, with thematic analysis applied to qualitative data and statistical analysis used for quantitative data. The study found that most teachers effectively formulated relevant lesson objectives, demonstrating a commitment to facilitating student learning. It provided insights into the successes and challenges of lesson planning and delivery.

However, reliance on self-reported data from lesson evaluation forms introduced potential biases. Additionally, the study focused primarily on the systematic study of invertebrates, leaving gaps in the exploration of other biology topics. To address this, the current study broadened the scope to include a wider range of physics subjects.

7. Research design and methodology

This study employed a convergent design within a mixed-methods framework, collecting quantitative and qualitative data simultaneously for a comprehensive analysis (Creswell & Creswell, 2018). The sample included 61 school heads, 123 physics teachers, 2745 students from 61 public high schools, and 1 District School Quality Assurance Officer (DSQAO), with a final selection of 363 respondents using both probability and non-probability sampling techniques. Data collection involved surveys for physics teachers and students, interviews with school heads and the Quality Assurance Officer, and document analysis for physics teachers. Experts from Mwenge Catholic University (MWECAU) validated the research instruments, ensuring credibility.

A pilot test in three public high schools refined the clarity of the tools. The reliability of teacher and student questionnaires was assessed using Cronbach's alpha (0.84 and 0.79, respectively), confirming strong internal consistency. Peer debriefing and triangulation enhanced the reliability of qualitative instruments. Data analysis was conducted using SPSS version 22, focusing on descriptive statistics like frequencies, percentages, and mean scores. Thematic analysis was used for qualitative data, involving data familiarization, organization, coding, and contextual presentation. Ethical considerations guided the research process, ensuring validity and integrity.

8. Findings

This section consists of the research findings on the power of teachers' portfolios in planning physics lessons. Data were collected through questionnaires, interviews, and analysis of documents.

A five-level Likert scale was utilized for data analysis, with 1 representing strongly disagree (SD); 2 = disagree (D); 3 = undecided (U); 4 = agree (A); 5 = strongly agree (SA); F = frequencies; P = Percentages. The frequency and percentage distribution of responses were categorized as follows: $\leq$20 = extremely minority; 21–49 = minority; 50–59 = moderate; 60–69 = majority; 70–89 = very high majority; 90–99 = extremely majority; 100 = overwhelming majority (Taherdoost, 2019). A mean score greater than 3 indicated that the teacher's portfolio helps in the planning of teaching and learning of physics, while a mean score lower than 3 suggested otherwise. A mean score exactly equal to 3 implied that the teacher's portfolio is neither helpful nor unhelpful in the planning of teaching and learning of physics (Hutchinson & Chyung, 2023). Responses for teachers are summarized in Table 1.

The data in Table 1 indicate that an overwhelming majority (100%) of teachers agree and strongly agree that the planning of portfolios helps teachers to select relevant aspects for teaching. Conversely, a minority (33.3%) of teachers are undecided on whether the planning of portfolios helps teachers to select relevant aspects for teaching. The mean score is 4.67 for teachers. The data imply that teachers overwhelmingly believe that planning portfolios is a highly effective strategy for selecting relevant teaching aspects. This confidence in portfolio planning suggests that teachers find it instrumental in organizing and prioritizing instructional content, thereby enhancing the overall quality and focus of their teaching. The high mean score of 4.67 further supports this notion, indicating a strong consensus among teachers regarding the benefits of using portfolios as a planning tool.

The researcher, during a face-to-face interview with a Head of School, had this to say:

> Without a clear plan, teachers can struggle to know what to prioritize and how to connect different learning points throughout the year. Portfolios help teachers organize their thoughts and materials, like lesson plans, student work samples, and even their reflections on teaching strategies. This way, they can pick and choose the most relevant aspects to create a focused and effective learning experience for the students (HoS9 personal interview, 27 March 2024).

The statement implies that having a clear plan is essential for teachers to effectively prioritize and connect learning points over the academic year. Without a structured approach, teachers may face challenges in determining what to focus on and how to establish meaningful connections between different concepts. By utilizing portfolios to compile and organize key elements such as lesson plans, student work samples, and reflections on teaching strategies, teachers can streamline their thoughts and resources. This organized method enables teachers to carefully select the most pertinent aspects, leading to the creation of a coherent and engaging learning experience for their students. Ultimately, the implication is that portfolio utilization facilitates a more deliberate and purposeful teaching approach, enhancing the overall quality of education provided. Regarding how the planning of portfolios helps teachers to select relevant aspects for teaching, a District School Quality Assurance officer had this to say:

> A classroom without a blueprint can be challenging for teachers to ensure that all the building blocks of knowledge come together for students. Teacher portfolios act as a detailed plan to guide the teaching. These portfolios become a valuable collection of lesson plans, examples of student work, and the teachers' thoughts on their teaching

Table 1. Teachers (TRs) responses regarding the help of the teacher's portfolio in the planning of teaching and learning of physics in public secondary schools in Moshi District Council, Tanzania (n = 12).

	Statements	SD		D		U		A		SA		M
		F	%	F	%	F	%	F	%	F	%	
i.	Planning of portfolio helps me to select relevant aspects for teaching.	0	0.0	0	0.0	0	0.0	4	33.3	8	66.7	4.67
ii.	I consider curriculum objectives when choosing portfolio aspects.	0	0.0	0	0.0	0	0.0	8	66.7	4	33.3	4.33
iii.	I do include a variety of teaching and learning activities in the portfolio	0	0.0	0	0.0	4	33.3	0	0.0	8	66.7	4.33
iv.	The physics portfolio reflects the progression of learning in my class.	0	0.0	0	0.0	4	33.3	8	66.7	0	0.0	3.67
v.	I do select portfolio aspects that promote critical thinking skills.	0	0.0	0	0.0	4	33.3	0	0.0	8	66.7	4.33
vi.	The portfolio includes different assessment methods for my students (e.g., projects, tests, etc.)	0	0.0	0	0.0	4	33.3	8	66.7	0	0.0	3.67
vii.	I do choose portfolio aspects that encourage students' creativity.	0	0.0	0	0.0	4	33.3	0	0.0	8	66.7	4.33
viii.	I normally consider students' prior knowledge when choosing portfolio aspects.	0	0.0	4	33.3	0	0.0	8	66.7	0	0.0	3.33
ix.	The portfolio includes aspects that promote problem-solving skills for my students.	0	0.0	0	0.0	0	0.0	0	0.0	12	100.0	5.00
x.	I do choose portfolio aspects that foster collaboration among students	0	0.0	0	0.0	0	0.0	8	66.7	4	33.3	4.33
	Grand Mean						4.19					

Source: field data (2024). Key: 1 = strongly disagree (SD); 2 = disagree (D); 3 = undecided (U); 4 = agree (A); 5 = strongly agree (SA); F = frequencies; P = percentages.

> methods. By reviewing this information, teachers can strategically select the most relevant aspects to create a strong foundation for learning (Interview with DSQAO on 30 March 2024).

Operating a classroom without a clear plan is like constructing a building without a blueprint, making it challenging for teachers to integrate essential knowledge effectively. Teacher portfolios act as structured guides, containing lesson plans, student work samples, and reflections on teaching methods. By engaging with these resources, educators can strategically select relevant elements to enhance student learning. Teacher portfolios promote intentional and cohesive teaching strategies, leading to a more effective educational experience. These findings align with those of Zulfqar and Javaid (2021), who emphasized that well-planned teaching activities improve content delivery, student outcomes, classroom organization, and overall teaching quality.

The data in Table 1 indicate that a majority (66.7%) of teachers agree and strongly agree that they do include a variety of teaching and learning activities in the portfolio. Conversely, a minority (33.3%) of students were undecided about whether they include a variety of teaching and learning activities in the portfolio. The mean score is 4.33 for teachers. The data imply that most teachers believe in the importance of incorporating a variety of teaching and learning activities in their portfolios. This approach likely reflects their understanding of the diverse learning needs and preferences of their students. By including different activities, teachers aim to create more engaging and effective learning experiences. The high mean score indicates a strong endorsement of this practice, suggesting that teachers see value in using varied instructional methods to enhance student learning and engagement. The researcher, during a face-to-face interview with a Head of School, had this to say:

> Teachers understand that students learn best when engaged in different ways. A strong portfolio should reflect that by including a variety of teaching and learning activities, like group discussions, projects, interactive games, individual writing assignments, or even technology-based activities. This demonstrates to anyone reviewing the portfolio the teacher's ability to cater to diverse learning styles and keep students engaged (HoS5 personal interview, 13 March 2024).

The statement implies that a portfolio should reflect the teacher's ability to engage students through a variety of teaching and learning activities, demonstrating adaptability to different learning styles. This includes incorporating group projects that foster collaboration, interactive games that make learning enjoyable, and individual writing assignments that develop critical thinking skills. Addi-

tionally, integrating technology-based activities shows the teacher's commitment to modern educational practices. By showcasing this diverse range of methods, the portfolio highlights the teacher's skill in creating a dynamic and inclusive learning environment that keeps students engaged and caters to their diverse needs. The findings of the study are in line with the findings of the study by Guillaume and Yopp (2019), who affirmed that portfolios enrich teaching and learning for students when they are provided with a variety of tasks.

The data in Table 1 show that 66.7% of teachers agree or strongly agree that their portfolios include various assessment methods, such as projects and tests. In contrast, 33.3% of teachers are undecided about whether their portfolios incorporate these diverse methods. The mean score for teachers is 3.67, suggesting that a majority of teachers recognize the importance of including different assessment methods in their portfolios. This approach reflects an understanding of the need for varied evaluation techniques to address different student strengths and learning styles. However, the moderate mean score indicates some uncertainty or inconsistency in implementation, pointing to a need for professional development. Ensuring that all teachers feel confident in using a variety of assessment methods could help to more accurately measure student learning and improve the overall quality of teaching. The researcher, during a face-to-face interview with the DSQAO, had this to say:

> Teachers need a variety of assessment methods in their portfolios, just like a toolbox needs different tools! This allows them to accurately gauge student learning in a way that caters to diverse strengths and learning styles. A strong portfolio should showcase projects, tests, quizzes, or even self-assessments by students, demonstrating the teacher's ability to use a well-rounded approach to evaluation (DSQAO personal interview, 30 March 2024).

Regarding the inclusion of different assessment methods for students, a Head of School had this to say:

> Teacher who only uses tests to measure student understanding. It doesn't give a complete picture! A strong portfolio should showcase a variety of assessment methods, like projects that allow students to demonstrate creativity, presentations where they can communicate their learning, quizzes for quick checks on understanding, or even self-assessments where students reflect on their progress. This variety shows anyone reviewing the portfolio that the teacher can accurately assess student learning in different ways engaged (HoS4 personal interview, 11 March 2024).

The interviews suggest that teachers need diverse assessment methods in their portfolios, much like a toolbox requires various tools for different tasks. By incorporating projects, tests, quizzes, and student self-assessments, teachers can effectively evaluate student progress while accommodating different learning styles. A well-structured portfolio demonstrates a teacher's ability to apply a comprehensive approach to assessment, fostering inclusivity and improving learning outcomes. These findings align with those of McMullan et al. (2020), who emphasized that portfolios can integrate multiple assessment methods to measure student competence, with reflection playing a crucial role in enhancing both teaching effectiveness and student learning.

The data in Table 1 show that 66.7% of teachers agree or strongly agree that they select portfolio aspects that promote students' creativity, while 33.3% are undecided. The mean score for teachers is 4.33, indicating a strong recognition of the importance of fostering creativity through portfolio activities. While most teachers show a commitment to encouraging creativity, the uncertainty among a minority suggests a need for clearer guidance on incorporating creative elements. The high mean score reflects a positive trend toward creative teaching, yet it also points to a need for professional development to ensure all teachers can effectively nurture creativity. The researcher, during a face-to-face interview with Head of the school, had this to say:

> Our teachers recognize this, and they actively seek out portfolio aspects that spark creativity in our students. A strong portfolio should reflect this by including activities that allow students to think outside the box, like open-ended projects where they can design their solutions, creative writing prompts that encourage them to tell stories in unique ways, or even presentations where they can showcase their ideas in a visually engaging format (HoS1 personal interview, 4 March 2024).

The response from Head of School of school 1 showed that teachers value sparking creativity in students and incorporate activities in their portfolios to foster out-of-the-box thinking. Encouraging elements like open-ended projects, creative writing prompts, and visually engaging presentations aim to inspire students to think creatively and express themselves uniquely. This approach indicates a commitment to nurturing students' creativity and innovation within the learning environment. The findings of the study are in line with the findings of the study by Ismail (2019), who affirmed that a portfolio plays a role in the formation of students' creative abilities and can be considered a means of creating key competencies in the educational process.

Table 1 shows that 100% of teachers agree or strongly agree on selecting portfolio aspects that foster student collaboration, with a mean score of 4.33. This unanimity highlights the value placed on teamwork and cooperative learning in education. Teachers recognize that collaboration enhances academic performance and builds social and communication skills. The findings align with the Reflective Practice Theory (RPT), which emphasizes the importance of critically examining one's experiences, actions, and be-

liefs to enhance professional practice and facilitate continuous learning and development.

The data in Table 2 reveal that a majority (94.6%) of students agree or strongly agree that their teacher clearly explains what they will learn in physics and why it is important. Conversely, a small minority (3.6%) disagree or strongly disagree with this statement. The mean score for students is 4.60, indicating a strong positive perception of the teacher's communication. This suggests that most students feel their teacher effectively conveys the learning objectives and the relevance of physics lessons. Such clarity likely enhances student motivation and engagement, as understanding the importance of the material encourages greater effort and interest. This approach appears to contribute to a more effective and meaningful learning experience in physics, as students are more likely to invest in their education when they see the real-world applications and significance of what they are learning. The researcher, during a face-to-face interview with a Head of School, had this to say:

> Our teachers understand this; They make a conscious effort to explain the learning objectives at the beginning of every physics lesson, and most importantly, they connect those objectives to the real world. They show students how physics applies to everyday life or how it might be used in future careers, like understanding forces when designing a bridge or exploring the science behind flight in airplanes (HoS2 personal interview, 6 March 2024).

The response implies that teachers emphasize the importance of connecting learning objectives to real-world applications in physics lessons. By explaining how physics concepts are relevant to everyday life and future career paths, teachers help students see the practical implications and significance of what they are learning. This approach aims to make physics more engaging and meaningful for students by showing them how the principles they study in class have practical applications in the world around them. Ultimately, the implication is that linking physics to real-world contexts enhances student understanding and motivation to learn. The finding of the study is in line with the findings of the study by Williams et al. (2019), who affirmed that secondary school students find physics interesting due to its perceived application and relevance to the real-world environment.

The data in Table 2 show that 93.5% of students agree or strongly agree that their physics teacher understands their knowledge, while only 1.8% disagree or strongly disagree. The mean score is 4.41, indicating a high level of student satisfaction with the teacher's understanding of their knowledge. This suggests that the teacher's portfolio effectively helps them assess and address students' existing knowledge. The strong agreement implies that the teacher is skilled at using this understanding to inform teaching strategies. Consequently, the portfolio plays a crucial role in planning lessons that are tailored to students' needs, addressing knowledge gaps, and building on their current understanding. This personalized approach enhances the teaching and learning process, making physics lessons more relevant and effective for students. The researcher, during a face-to-face interview with a Head of the School, had this to say:

> Teacher who launches into a complex physics concept without first understanding what their students already know. It can be frustrating for students, leaving them feeling lost and confused. Our physics teacher does a fantastic job of utilizing their portfolio to truly understand each student's learning journey. They assess student knowledge through various methods, and this information goes straight into the portfolio (HoS2 personal interview, 7 March 2024).

Regarding how the physics teacher shows an understanding of student knowledge, the DSQAO had this to say:

> In a classroom where the teacher lectures on advanced concepts without gauging student understanding first. Students can quickly become lost and disengaged. Here at the District School Quality Assurance office, we firmly believe a well-maintained portfolio is a cornerstone of effective teaching, especially in science subjects like physics (DSQAO personal interview, 30 March 2024).

The information from the Head of School of school 2 and the District School Quality Assurance Officer implies that the physics teacher's effective use of a portfolio plays a crucial role in understanding students' learning journeys and assessing their knowledge. By employing various methods to gauge student understanding and documenting this information in the portfolio, the teacher ensures that teaching strategies are tailored to meet individual student needs. This approach enhances student engagement, comprehension, and overall teaching effectiveness, highlighting the significance of a well-maintained portfolio in promoting successful teaching practices, particularly in science subjects like physics. The finding of the study is congruent with the study by Zee and Minstrell (2020), who affirmed that a physics teacher fosters communication of physics principles through reflective discourse, which involves students expressing their thoughts and questions and the teacher engaging in questioning exchanges to help students better articulate their beliefs and conceptions.

The data in Table 2 reveal that 95% of students agree or strongly agree that their physics teacher provides a clear plan for covering all necessary topics, while only 1.5% disagree or strongly disagree. The mean score is 4.67, indicating strong student satisfaction with the teacher's planning. This suggests that the teacher's portfolio plays a significant role in the effective organization and planning of the curriculum. The high level of agreement indicates that the

Table 2. Students' (STs) responses on the help of teachers' portfolios in the planning of teaching and learning of physics in public secondary schools in Moshi District Council, Tanzania (n = 338).

	Statements	SD		D		U		A		SA		M
		F	%	F	%	F	%	F	%	F	%	
i.	The teacher explains what students will learn in physics lesson and why it is important to students.	0	0.0	12	3.6	6	1.8	87	25.7	233	68.9	4.60
ii.	The teacher helps to clear up any wrong ideas students might have about physics.	0	0.0	9	2.7	14	4.1	144	42.6	171	50.6	4.41
iii.	The learning activities in physics are interesting and engaging	5	1.5	11	3.3	9	2.7	108	32.0	205	60.7	4.47
iv.	The students learn physics by doing instead of just listening	11	3.3	11	3.3	24	7.1	166	49.1	126	37.3	4.14
v.	The physics teacher shows an understanding of student knowledge	0	0.0	6	1.8	16	4.7	150	44.4	166	49.1	4.41
vi.	Tests and exams are well planned and meaningful to students	0	0.0	12	3.6	12	3.6	62	18.4	251	74.5	4.64
vii.	The physics teacher provides a clear plan for covering all necessary Physics topics	0	0.0	5	1.5	12	3.6	71	21.0	250	74.0	4.67
viii.	The teacher makes Physics easy by focusing on the main important things student need to know	0	0.0	0	0.0	7	2.1	207	61.2	124	36.7	4.35
ix.	The teacher teaches both theory and practical lessons in physics subject	0	0.0	3	0.9	5	1.5	149	44.1	181	53.6	4.50
x.	Hands-on laboratory experiments and demonstrations improve learning	0	0.0	0	0.0	0	0.0	73	21.6	265	78.4	4.78
Grand Mean Score												4.49

Source: field data (2024). 1 = strongly disagree (SD); 2 = disagree (D); 3 = undecided (U); 4 = agree (A); 5 = strongly agree (SA); F = frequencies; P = percentages.

teacher offers a comprehensive and transparent plan, ensuring students understand what will be taught and when. This structured approach likely results from careful portfolio planning, helping to address the syllabus systematically and meet educational standards. As a result, this clarity and organization enhances the learning environment, increasing students' confidence and readiness to engage with the subject matter. The researcher, during a face-to-face interview with the DSQAO, had this to say:

> The student entering a physics class is unsure of what will be covered and when. This lack of clarity can lead to confusion and disengagement. Here at the DSQA office, we believe a well-structured curriculum, meticulously planned and documented in a teacher's portfolio, is vital for successful learning, especially in science subjects like physics. The physics teacher's portfolio likely acts as a roadmap, guiding instruction throughout the year. By incorporating resources, lesson plans, and pacing guides into their portfolio, the teacher ensures a comprehensive and transparent plan for covering all necessary topics. Students know what to expect and when to expect it and can feel confident as they progress through the physics curriculum (DSQAO personal interview, 30 March 2024).

The information implies that having a well-structured curriculum documented in the teacher's portfolio is essential for successful learning, particularly in science subjects like physics. A meticulously planned curriculum helps provide clarity for students, reducing confusion and disengagement. The portfolio serves as a roadmap for the teacher, guiding instruction and ensuring that all necessary topics are covered comprehensively and transparently. By incorporating resources, lesson plans, and pacing guides into the portfolio, the teacher creates a structured learning environment where students know what to expect and can progress confidently through the physics curriculum. The finding of the study is in line with those by Hashweh (2019), who affirmed that teachers' prior subject-matter knowledge influences their planning for instruction and their use of explanatory representations in covering the topics to students.

The data in Table 2 show that 97.9% of students agree or strongly agree that their physics teacher makes the subject easier by focusing on the key concepts students need to know, while 2.1% are undecided. The mean score is 4.35, indicating a high level of student satisfaction. This suggests that students perceive the teacher as effective in simplifying physics by concentrating on essential concepts. The high level of agreement indicates that the teacher's approach emphasizes core principles, helping students better understand and navigate the complexities of physics. By focusing on crucial content, this approach enhances students'

comprehension and engagement, making the subject more accessible. This highlights the importance of prioritizing key concepts in teaching to improve student learning outcomes and overall effectiveness in physics education. The researcher, during a face-to-face interview with a Head of School, had this to say:

> If someone threw a mountain of information at you in class, it would be overwhelming, right? Our physics teacher understands this. They know the key to success is prioritizing the core concepts and principles that matter in physics. This core knowledge becomes the foundation for everything else. We believe in making physics accessible to all students. By focusing on the essential building blocks, our physics teacher simplifies the subject without sacrificing any of the important learning outcomes (HoS6 personal interview, 10 March 2024).

The response implies that the physics teacher prioritizes core concepts and principles in teaching, recognizing the importance of focusing on essential building blocks to simplify the subject without compromising important learning outcomes. By emphasizing the key foundational knowledge in physics, the teacher aims to make the subject accessible to all students and create a structured learning environment that facilitates understanding and retention of key concepts. This approach suggests a strategic and effective teaching method that prioritizes clarity and comprehension for students. The finding of the study is in line with those of Hashweh (2019), who affirmed that teachers can make the subject easy by focusing on the main important concepts students need to know by modifying textbook content and using portfolios.

The data in Table 2 indicate that an extreme majority (97.7%) of students agree and strongly agree that the physics teacher teaches both theory and practical lessons in the physics subject. Conversely, a small minority (0.9%) of students disagree and strongly disagree that the physics teacher teaches both theory and practical lessons in physics. The mean score is 4.50 for students. This implies that students overwhelmingly agree that their physics teacher effectively teaches both theory and practical lessons. This suggests that the teacher's portfolio likely supports a well-rounded approach to planning and delivering physics education, focusing on integrating theoretical concepts with practical applications. This balanced approach is crucial for enhancing students' understanding and skills in the subject, aligning teaching strategies with the holistic learning objectives of physics education. The researcher, during a face-to-face interview with a Head of School, had this to say:

> Learning physics solely through textbooks—it wouldn't be very inspiring, would it? Our physics teacher understands this completely. Their well-organized portfolio is key to their success, acting as a roadmap for integrating theoretical concepts with practical applications. Students aren't just memorizing facts; they're actively engaging with the "why" and "how" of physics (HoS7 personal interview, 25 March 2024).

With regard to teaching theory and practical lessons in physics, HoS11 had this to say:

> Think back to your own school days. Did you ever have a subject where everything was just textbook learning? It wasn't very inspiring, was it? Our physics teacher understands the importance of making the subject come alive for students. They leverage their portfolio as a powerful tool, ensuring their lessons seamlessly blend theory with practical application. Students don't just learn the "what," they get to experience the "how" of physics firsthand (HoS11 personal interview, 25 March 2024).

The interviews suggest that the physics teacher's well-organized portfolio serves as a roadmap for integrating theoretical concepts with practical applications in teaching physics. This approach goes beyond traditional textbook learning, engaging students in actively understanding the "why" and "how" of physics. By leveraging the portfolio as a powerful tool, the teacher ensures that lessons blend theory with real-world applications, making the subject come alive for students and providing them with hands-on experiences that enhance their learning and appreciation of physics. The finding of the study is in line with those of Ogegbo and Ramnarain (2022) who affirmed that the teaching of theoretical and practical physics effectively promotes students' professional opportunities in four linked degrees: physical knowledge, physical method, physical thought, physical life, physical experiment, and physics experience.

Generally, the study found that teacher portfolios play a crucial role in the planning and delivery of effective physics education in Moshi District, Tanzania. Teachers strongly support portfolio planning as a tool for organizing and prioritizing instructional content, enhancing teaching quality. Students also agreed that the portfolio effectively communicates learning objectives which help to form an understanding of their knowledge, and provides clear lesson plans. This approach increases student engagement and comprehension. The portfolios encourage creativity, collaboration, and the integration of theoretical concepts with practical applications, fostering a student-centered learning environment. Both teachers and students recognize the portfolio's value in selecting diverse teaching strategies and creating an engaging learning atmosphere. Overall, well-structured portfolios contribute significantly to the quality of physics education, promoting active learning and improving student outcomes through feedback and reflection.

9. Conclusion

In conclusion, the research demonstrates that teacher portfolios play a pivotal role in planning for the effective teaching and learning of the subject of physics. Portfolios assist teachers in organizing and prioritizing curriculum content, ensuring that lessons are aligned with educational objectives and student needs. However, challenges related to the organization and timely accessibility of portfolio documents were identified, which appeared to hinder its effectiveness in enhancing reflective practices and providing constructive feedback to students.

10. Recommendations

In light of the conclusions, the study recommends the prioritization of the effective organization of portfolio documents to enhance utility in lesson planning to the District School Quality Assurance Officers. Additionally, the Government through the Ministry of Education Science and Technology (MoEST) should carry out capacity-building training specifically aimed at equipping physics teachers with the skills to organize and effectively utilize portfolios in lesson delivery and assessment. Furthermore, physics teachers should actively utilize portfolios to provide meaningful feedback and track students' learning progress. Lastly, Heads of Schools should ensure adequate resources necessary for the preparation and compilation of portfolios to support effective tracking of student learning outcomes in physics education.

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Conflicts of interest

The author(s) declare no conflict of interest.

Data availability statement

Data supporting these findings are available within the article or upon request.

Institutional review board statement

Not applicable.

Informed consent statement

Written informed consent has been obtained from the patient(s) to publish this paper.

Sample availability

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