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Head Teachers' Portfolio Appraisal Practices and Learner Mathematics Achievement in Public Primary Schools in Kisumu County, Kenya.

Samuel Osamba Okello[1] Prof. Susan Chepkonga[2] Prof. Paul Odundo[3] & Prof. Jeremiah Kalai[4]
samuelosamba@students.uonbi.ac.ke;syego@uonbi.ac.ke;odundopaul@uonbi.ac.ke; jeremykalai@uonbi.ac.ke
Department of Educational Management Policy and Curriculum Studies, University of Nairobi[124]
Department of Educational Communication and Technology[3]

Abstract

The study investigated the influence of head teachers' portfolio appraisal practices on learner achievement in Mathematics in public primary schools in Kisumu County, Kenya. The study was guided by the following hypothesis: $H0_1$: There is no significant relationship between head teacher portfolio appraisal practices and learner Mathematics achievement in public primary schools in Kisumu County, Kenya. The literature review focused on the appropriate objectives, theoretical framework, and conceptual framework. The theoretical framework was based on Transformational Leadership Theory, proposed by James MacGregor Burns in 1978, which emphasized the role of leaders who inspire and motivate their followers to achieve higher levels of performance, beyond just meeting immediate needs. A cross-sectional survey design was used. The target population for the study was 127 public primary Schools in Kisumu County, 675 head teachers, and 760 teachers of grades three and four in public primary schools in Kisumu County, 1 Sub County QASO, and 7 CSOs. Proportionate sampling on 103 schools, stratified sampling on 103 principals, census sampling 1QASO and 7 CSOs, and simple random sampling on 78 teachers. Interview schedules for Principals, QASO, and CSO, and questionnaires for teachers were used as instruments for data collection. After data cleaning, the data were coded and entered into the computer for analysis using the Statistical Package for Social Sciences (SPSS) version 22. The quantitative data were analysed using descriptive statistics such as frequencies, percentages, means, and standard deviation. Inferential statistics were analysed using Chi-square for all the objectives. Qualitative data were processed by transcribing and categorizing from interviews and open-ended questions, using content analysis and reported as narratives, verbatim, or converted to frequency tables. The findings showed that the hypothesis was rejected. On head teacher portfolio appraisal practices and learner Mathematics Achievement Chi square (df=6, Pearson Chi square($\chi 2$) =53.543 and p=0.000 at 0.05 level of significance. This showed a significant relationship between head teacher portfolio appraisal practices and learner Mathematics Achievement. The study concluded that head teacher portfolio appraisal practices influenced learner Mathematics Achievement. It is then recommended that head teachers use data from portfolio appraisals to make informed decisions about teaching methods, instructional resources, and student interventions in mathematics.

Keywords: Influence, Head teachers' portfolio appraisal practices, Learner Mathematics Achievement, Public primary schools

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1. Introduction

In the USA, Smith & Johnson (2020) analyzed the impact of head teacher supervisory practices on portfolio appraisals in 50 middle schools and indicated that structured and frequent supervisory sessions correlated with higher student mathematics achievement and that Supervisory practices promoting formative portfolio appraisals empowered teachers to align instructional strategies with student needs, leading to a 15% improvement in mathematics outcomes. In the U.K, Brown & Watson (2019) investigated Portfolio Assessment in Mathematics and the Role of Head Teachers and found that Head teachers implementing consistent supervisory practices reported enhanced teacher engagement with portfolio appraisals with an 8% improvement in mathematics scores among primary school learners and supervisory practices that focused on teacher reflection and regular feedback significantly influenced the quality of portfolio use in assessing student learning progress. In France, Dubois & Clément (2021) found that French primary schools adopting head teacher-led supervisory approaches for portfolio appraisals witnessed a 10% increase in mathematics competency, particularly in problem-solving, and that supervisory practices focusing on professional development sessions and collaborative feedback sessions improved teacher capacity to implement portfolio assessments effectively. In Canada O'Connor & Miller, (2022) investigated Supervisory Practices in Mathematics Assessment: Portfolio Use in Canadian with a mixed-method

study of 30 schools in Ontario and found a positive correlation between structured head teacher supervision and the use of portfolios for continuous assessment and highlighted a 12% improvement in standardized test scores in mathematics with emphasis on reflective supervision and collaborative appraisal models facilitated better teaching practices and student outcomes.

In Nigeria, Adewale & Olatunji, (2020) investigated the supervisory practices of head teachers and their impact on the use of portfolio appraisals in 30 public primary schools and revealed that regular and structured supervisory practices significantly improved teacher adherence to portfolio-based assessment methods, leading to a 12% increase in learner performance in mathematics and that supervisory practices focusing on periodic teacher evaluations, collaborative planning, and workshops enhanced portfolio implementation, positively impacting learner achievement in mathematics. In South Africa, Mhlongo & Nkosi, (2021) conducted in 15 rural schools, the role of head teacher supervision in improving portfolio-based assessments and found that active supervision, including lesson observations and regular feedback, improved mathematics outcomes by 10% on standardized tests and supervisory practices that include mentoring sessions and support for innovative portfolio use were found to be crucial in enhancing teacher effectiveness and student performance. In Egypt, Abdelwahab & Hassan, (2022) investigated Supervisory Practices and Mathematics Achievement: The Mediating Role of Portfolio Assessment from 25 public schools in Cairo, highlighting the positive effects of supervisory practices on mathematics achievement through portfolio appraisals and indicated a 15% improvement in learner problem-solving skills when head teachers conducted regular classroom visits and portfolio reviews and that the integration of formative supervisory practices and portfolio assessments enhanced teacher practices, which directly contributed to higher student achievement in mathematics.

In Tanzania, Mitchell & Simmonds, (2024) synthesized research evidence on teacher professional development (TPD) provision in sub-Saharan Africa, with a focus on Tanzania and highlighted the importance of continuous professional development and the role of school leadership in supporting effective teaching practices and emphasized the need for well-structured TPD programs and active involvement of head teachers in supervising and supporting teachers to enhance educational outcomes. In Uganda, Kabuuka, Kaggwa & Kasujja, (2024) investigated the influence of headteacher support supervision on enhancing teachers' teaching effectiveness in Universal Primary Education (UPE) schools in Kibaale Town Council, Uganda and revealed that, despite challenges, head teachers' supervisory activities positively influenced teachers' effectiveness in teaching and recommended that the Ministry of Education and Sports allocate sufficient resources to schools to ensure effective supervision and organize refresher training to equip head teachers with supervisory skills. In Rwanda, Ndayambaje, (2023) investigated the challenges of head teachers' instructional supervision in public primary schools in Nyaruguru District, Rwanda and indicated that head teachers faced various challenges, including limited resources and inadequate training, which hindered effective instructional supervision and recommended capacity-building programs for head teachers to enhance their supervisory skills and improve teaching effectiveness.

In Kenya, Shikokoti, Okoth & Chepkonga (2023) examined the practices and procedures of internal instructional supervision in public secondary schools in Kenya and found that while head teachers recognized the importance of instructional supervision, there were challenges in effectively implementing supervisory practices due to factors such as inadequate training and limited resources and recommended the need for professional development programs to enhance the supervisory skills of head teachers and improve the quality of teaching and learning in schools. Otieno, (2020) investigated the relationship between assessment for learning practices and mathematics achievement in public secondary schools and revealed that formative assessment practices, including portfolio assessments, were positively correlated with improved student performance in mathematics and recommended the integration of assessment for learning strategies in teaching to enhance student engagement and achievement in mathematics. Shikokoti (2023) explored the characteristics of head teachers and their effectiveness in managing school facilities and suggested that head teachers' leadership styles and management practices significantly influenced the overall school environment, which in turn affected student performance and emphasized the need for head teachers to adopt effective management practices to create conducive learning environments that support student achievement. Ndegwa & Muthaa, (2019) investigated the relationship between head teachers' instructional supervision and student performance in Mathematics in secondary schools and found that frequent classroom observations and constructive feedback provided by head teachers positively impacted learners' Mathematics achievement and concluded that effective supervision fosters a culture of accountability and encourages teachers to implement innovative instructional strategies, including portfolio appraisal, which enhances learner outcomes.

Kamau & Mutai, (2021) demonstrated that the use of portfolio appraisal, when guided by head teachers' supervisory practices, improved students' ability to conceptualize and solve mathematical problems and

concluded that head teachers who actively monitor portfolio appraisal practices ensure that teachers maintain high standards of formative assessment, which positively influences Mathematics performance. Wambua & Njeru, (2023) examined Leadership Styles of Head Teachers and Their Impact on Assessment Practices in Kenyan Public Schools and revealed that participatory leadership by head teachers, which includes collaborative supervision of portfolio assessments, had a significant impact on Mathematics performance and that supervisory practices that emphasize collaborative planning and regular follow-up are more likely to enhance the effectiveness of portfolio assessments. Otieno & (2020) investigated the Role of Head Teacher Supervision in Promoting Effective Mathematics Teaching in Public Secondary Schools in Kenya and noted that head teachers who frequently supervised and offered guidance on portfolio-based assessments contributed to improved student engagement and better Mathematics outcomes and that regular and supportive supervision motivates teachers to adopt comprehensive assessment techniques, enhancing learner achievement.

In Kisumu County, Akoth, (2021) examined the impact of head teachers' instructional supervision techniques on the implementation of the Competency-Based Curriculum (CBC) in public primary schools in Kisumu West Subcounty and indicated that effective supervisory practices, such as regular classroom observations and feedback, significantly influenced the successful implementation of CBC, which emphasizes continuous assessment methods, including portfolio appraisal and recommended that head teachers enhance their supervisory roles to support teachers in adopting new assessment strategies integral to CBC, thereby potentially improving learner outcomes in subjects like mathematics. Agunda, Onderi & Ajowi, (2016) explored the relationship between class size and academic achievement among female students in mathematics in secondary schools in Kisumu County and highlighted that smaller class sizes allowed for more personalized instruction and assessment, which could include portfolio-based methods and suggested that reducing class sizes might enable teachers to implement more effective assessment strategies, potentially leading to improved mathematics achievement. Ouko (2020) investigated how different learning environments influenced student performance in various mathematics tasks in Kisumu County and found the importance of supportive learning settings in enhancing mathematics achievement, implying that creating conducive learning environments, potentially facilitated by effective supervisory practices, could positively impact student performance in mathematics.

2. Statement of the problem

The Kenyan primary education system, particularly under the Competency-Based Curriculum (CBC), faces significant challenges in implementing effective head teacher supervision of teachers' assessment practices. These challenges stem from resource constraints, high teacher-pupil ratios, and expanding school sizes, which limit the acquisition of critical thinking and problem-solving skills among learners (Odhiambo et al., 2024). In Kisumu County, the high teacher-pupil ratio of 1:51 and growing school sizes have led to deficient education, unmet learning outcomes, ineffective head teacher support structures, and low levels of intrinsic motivation among teachers (Mugo et al., 2015; Monk, 2020). Furthermore, Kenyan primary schools struggle to nurture lifelong learning skills and values due to insufficient teacher support (Griffin & Care, 2015). The acquisition of 21st-century mathematical skills remains weak due to limitations in robust measurement tools, teacher in-service training, and appropriate learning models, given the CBC's emphasis on continuous assessment of learning competencies and learner-centered teaching-learning approaches (Hoskins & Liu, 2019; Voogt & Roblin, 2012). Despite successful pilot programs focusing on continuous assessment within the CBC structures, challenges in scaling up these initiatives persist due to inadequate leadership and resource support (Achuti, 2018). Kisumu County's rapidly urbanizing population and stretched educational resources create a complex context for investigating leadership and assessment practices in schools. While some public primary schools in Kisumu County demonstrate significant improvement in learner performance in mathematics, the majority show relatively below-average performance, highlighting the need for further research on head teacher supervision and its influence on mathematics achievement (Okoth, 2019). Based on this realization, the study seeks to investigate the interlink between head teacher supervisory practices on portfolio appraisal and learner achievement in Mathematics in grades three and four in public primary schools in Kisumu County.

3. Objective of the Study

The study was based on the following research objectives:

1. To determine the influence of head teachers' portfolio appraisal practices on learner Mathematics Achievement in public primary schools in Kisumu County, Kenya.

4. Research Hypothesis

The study was based on the following research hypothesis:

1. $H0_1$: There is no Significant relationship between head teachers' portfolio appraisal practices and learner Mathematics Achievement in public primary schools in Kisumu County, Kenya.

5. Literature Review

5.1 Learner Mathematics Achievement

Mwebi & Mwaura, (2022) explored how students' attitudes and motivation towards mathematics affect their academic performance and revealed that positive attitudes and intrinsic motivation significantly enhance students' mathematics achievement. Njoroge & Juma (2023) assessed the effect of the classroom environment and available resources on mathematics achievement in secondary schools in Mombasa County and concluded that well-equipped classrooms and adequate learning materials positively correlate with improved mathematics scores. Kiarie & Ochieng (2021) explored how teachers' pedagogical competence influences students' mathematics achievement in secondary schools in Kisumu County and highlighted that teachers who employ a variety of teaching strategies, including inquiry-based methods, tend to have students who perform better in mathematics. Kipchumba & Kogo, (2019) investigated the effectiveness of digital learning tools (e.g., interactive software, educational websites) on improving learners' mathematics performance in secondary schools in Nairobi and found that digital tools significantly enhance student engagement and understanding, leading to better academic performance. Chege & Gikonyo (2020) examined how parental involvement in educational activities influences students' mathematics achievement and found that active parental participation, including helping with homework and attending school events, positively affects learners' academic success in mathematics. Nyamwange & Oyugi (2021) explored the impact of various teaching strategies on learners' mathematics achievement in primary schools in Kisii County, Kenya, and found that the use of interactive and student-centered teaching methods significantly improved students' mathematics performance.

5.2 Head teachers' Portfolio Appraisal Practices and Learner Mathematics Achievement

According to Davis & Ponnamperuma (2018a), a portfolio appraisal is a tool that shows proof of meeting learning objectives. It is an assortment of different types of unique and carefully chosen works. A portfolio is a consistent and intentional record of a student's accomplishments that shows how well they perform, grow, and innovate in meeting learning objectives. The portfolio effectively satisfies the teacher's need that student assessments be both product and process oriented. Teachers are encouraged to use portfolios to illustrate students' continuous improvement by showcasing general changes in pupils from the start of the compilation of their work to the conclusion of a session (Pangkey *et al.,* 2018).Okafor & Ezeh, (2022) investigated the impact of head teachers' leadership practices, specifically portfolio appraisal systems, on student achievement in mathematics in Nigerian secondary schools and found that when head teachers use portfolio appraisals to monitor both teacher effectiveness and student progress, there is a direct positive effect on students' mathematics achievement and that teachers reported feeling more motivated, and students benefit from more focused and effective teaching strategies. Phehla & Molefe, (2021) examined the role of head teachers in improving learner mathematics achievement in South Africa through portfolio appraisal practices and found that head teachers who use portfolio assessments to monitor students' learning progress and provide feedback to teachers enhance both teaching effectiveness and student performance in mathematics and head teachers who regularly review students' mathematics portfolios and offer targeted support for teachers see improved outcomes in students' performance. Nyangweso & Okoth, (2020) explored the relationship between head teachers' supervisory practices, including portfolio appraisal, and student performance in mathematics in primary schools in Nairobi County and found that effective portfolio assessment practices, which include the regular evaluation of teacher performance and student work, are significantly associated with improved student outcomes in mathematics and that head teachers who provided continuous feedback and individualized support to teachers resulted in better student performance.

Msemwa & Lwanga, (2019) investigated the effect of head teachers' use of portfolio appraisal practices on the academic achievement of students in mathematics in secondary schools and concluded that schools with head teachers who engage in reflective portfolio appraisal practices, where teachers and students' work are regularly assessed and discussed, show an improvement in mathematics achievement and that teachers feel more accountable, and their teaching strategies are better aligned with students' needs, leading to enhanced performance in mathematics. Nsubuga & Muhwezi (2021) focused on how head teachers' supervisory and appraisal practices, particularly portfolio assessments, affect learners' mathematics performance in Ugandan primary schools and indicated that head teachers who actively engage in portfolio-based assessments, which document students' progress and provide feedback on teaching practices, contributed to a noticeable improvement in students' mathematics performance. Amankwah & Oppong, (2020) examines the role of portfolio appraisal by head teachers in enhancing the academic performance of students in mathematics in Ghanaian schools and suggested that head teachers who incorporate a structured portfolio appraisal system,

which includes frequent feedback on teaching methods and student work, see improvements in both teaching quality and learner achievement and that mathematics teachers' understanding of students' strengths and weaknesses is enhanced, leading to more targeted instructional strategies.

5.3 Theoretical Framework

The study was based on Transformational Leadership Theory, proposed by James MacGregor Burns in 1978, which emphasized the role of leaders who inspire and motivate their followers to achieve higher levels of performance, beyond just meeting immediate needs. In educational settings, this theory suggests that school leaders (head teachers) should not only manage but also inspire and support their staff (teachers) and students (learners) by creating a conducive learning environment that promotes growth, creativity, and performance improvement. In an educational context, transformational leadership can lead to significant improvements in teaching quality and student achievement, as leaders actively engage with teachers to enhance their instructional practices and provide feedback. This theory directly relates to the study of head teachers' portfolio appraisal practices as it emphasizes leadership strategies that promote the professional growth of teachers. In this context, head teachers, as transformational leaders, use portfolio appraisal practices as a tool for providing feedback, guiding teachers toward instructional improvement, and motivating them to adopt effective teaching methods, particularly in mathematics. Head teachers who engage in transformational leadership would likely use portfolios not just as a tool for assessment, but also as a method of encouraging reflection and professional development among their teaching staff. By providing constructive feedback through portfolio assessments, head teachers foster an environment of continuous improvement, which directly impacts student outcomes, including mathematics achievement. Through intellectual stimulation and individualized consideration, head teachers can help teachers adapt their methods to address the specific needs of students, ensuring that instructional strategies align with student abilities and promote higher academic achievement. This directly links transformational leadership to improved performance in mathematics, as teachers are empowered to modify their approach and adapt to students' learning styles and needs.

6. Research Methodology

Cross-sectional survey research design was used as it allows the researcher to describe characteristics of an individual or group as they really are (Shikokoti, Okoth & Abungana, 2024). A cross-sectional survey is only concerned with conditions or relationships that exist, opinions that are held, and processes that are ongoing. The target population for the study was 127 public primary Schools in Kisumu County, 675 head teachers and 760 teachers of grades three and four in public primary schools in Kisumu County, 1 Sub County Quality Assurance and Standards Officers, and 7 Curriculum Support Officers. In order to select the teachers, a 20% sample was used, which was deemed to be a big sample (Mugenda & Mugenda, 2019) and large enough to identify a significant effect (Kothari, 2019). Proportionate sampling on 103 schools, stratified sampling on 103 principals, census sampling 1QASO and 7 CSOs, and simple random sampling on 78 teachers. According to Cohen, Manions & Morrison (2018), the simple random sampling technique allows a researcher to get a representative sample without bias. Therefore, all teachers had equal chances to participate. Interview schedules for Principals, Quality Assurance and Standard Officers, and Curriculum Support Officers, and questionnaires for teachers were used as instruments for data collection. To enhance the content validity of the instruments, a pre-test of the instruments was carried out. Piloting aimed at testing the clarity of test items, suitability of language used, and the feasibility of the study. The reliability of the instruments was determined using the test-retest technique. Pearson product-moment correlation was used to compute the reliability coefficient (Shikokoti, Okoth, and Abungana, 2024). Descriptive statistics were used in the analyses of the collected data. For inferential statistics, the Chi-square test for hypothesis one was used to test the relationship between the hypotheses. The Statistical Package for Social Science (SPSS), version 22, was used to code and enter the data into the computer for analysis after the questions were reviewed for completeness.

Results

The results of objective one were presented in Table 1, which shows the distribution of head teacher portfolio appraisal practices on learner Mathematics achievement

Table 1: Distribution of head teacher portfolio appraisal practices on learner Mathematics achievement

Statement	SD		D		N		A		SA		Mean	Sd
	f	%	f	%	f	%	f	%	f	%		
Head teacher reviews and gives feedback on student portfolios.	5	6.4	3	3.8	11	14.3	45	57.7	14	17.9	3.77	1.006
Portfolio method effectively tracks students' progress.	2	2.6	4	5.1	8	10.3	44	56.4	20	25.6	3.97	0.897
Head teacher encourages student reflection in portfolios.	1	1.3	3	3.8	9	11.5	46	59.0	19	24.4	4.01	0.798
Portfolio method is integrated into the curriculum.	2	2.3	3	3.8	14	17.9	38	48.7	21	26.9	3.94	0.917
Head teacher values portfolios for holistic assessment.	1	1.3	4	5.1	17	21.8	39	50.0	17	21.8	3.86	0.864
Average Mean											**3.91**	**0.896**

Table 1 shows that the majority, 45(57.7%) of the teachers Agreed that the Head teacher reviews and gives feedback on student portfolios while 14(17.9% Strongly Agreed. This implies that the majority of the teachers agreed with a mean of (M=3.77, SD=1.006) that Head teacher reviews and gives feedback on student portfolios. This was corroborated by Oestergaard, Hansen & Ravn, (2024) who examined how portfolio assignments and peer feedback can enhance coherence and student engagement in course programs, thereby improving learning outcomes and found that structured portfolio assignments, coupled with systematic feedback, led to increased student engagement and a deeper understanding of the subject matter. The findings are also supported by Williams (2024) who evaluated the challenges and best practices in delivering effective student feedback in higher education and emphasized that effective feedback can significantly influence student motivation, learning, and performance. The principles discussed, such as timeliness, clarity, and constructiveness of feedback, are applicable across educational levels and subjects, including primary school Mathematics.

The Portfolio method effectively tracks students' progress. A Majority of 44(56.4% Agreed, while 20(25.6%) said Strongly Agree, and 8(10.3%) Neither Disagreed nor Agreed. This implies that the majority of the respondents agreed with a mean of (M=3.97, SD=0.897) that the Portfolio method effectively tracks students' progress. In contrast, Al-Jarrah and Ismail (2021) examined the impact of digital portfolio assessment on English

as a Foreign Language (EFL) learners' critical thinking, autonomy, and language skills and found significant improvements in these areas, indicating that portfolio assessment can effectively track and promote student progress in critical thinking and language proficiency. This finding is supported by Kim, Kee & Choi, (2020) who developed a portfolio assessment system for medical education, which included assessor selection, training, evaluation, and consensus-building components and demonstrated that a structured portfolio assessment system could effectively monitor and evaluate student progress in medical training, highlighting the method's applicability in professional education settings.

One head teacher encourages student reflection in portfolios. A Majority of 46(59.0%) of the teachers said Agree, while 19(24.4%) Strongly Agreed, and 9(11.5%) Neither Disagreed nor Agreed. This implies that the majority of the respondents agreed with a mean of (M=4.01, SD=0.798) that the Head teacher encourages student reflection in portfolios. The findings concur with Ngugi and Wanjiru (2021) conducted a study in Kenya focusing on reflective practices in public primary schools and observed that head teachers who encouraged students to use portfolios for reflection created a learning environment where students took greater ownership of their academic progress. Moreover, Ouma and Kamau (2020) explored the adoption of e-portfolios in East African schools and highlighted that head teachers played a pivotal role in motivating students to reflect on their learning journey and noted that e-portfolios were especially effective in fostering reflective thinking in resource-limited settings when head teachers provided appropriate training and support.

On Portfolio method is integrated into the curriculum 38(48.7%) of the teachers Agreed while 21(26.7%) Strongly Agreed and 14(17.9%) Neither Disagreed or Agreed respectively. This implies that some of the respondents agreed with a mean of (M=3.94, SD=0.917). It is agreed upon by Yang and Wong (2024) conducted a comprehensive literature review on e-portfolio implementation in higher education, focusing on processes, barriers, and strategies and identified common steps in integrating e-portfolios into curricula, including defining purposes, engaging stakeholders, selecting platforms, conducting workshops, creating e-portfolios, and evaluating projects. Papi, Tajeddin & Zarrinabadi, (2024) examined the effects of portfolio assessment on Saudi Arabian EFL learners' willingness to communicate, grit tendencies, and motivation and found that integrating portfolio assessment into the curriculum positively influenced these affective factors, suggesting that portfolios can enhance student engagement and persistence in language learning contexts

Table 1 shows majority 39(50.0%) Agreed that Head teacher values portfolios for holistic assessment, while 17(21.8%) Strongly Agreed and Neither Disagreed or Agreed respectively. This implies that some of the respondents agreed with a mean of (M=3.86, SD=0.864). The findings concur with Jepchumba Kariuki & Mabonga (2024) explored classroom assessment methods in early years education in Baringo County and revealed that teachers predominantly used written tests, contrary to the Basic Education Curriculum Framework's recommendation to avoid such assessments at the pre-primary level. Additionally, the study found that teachers had not guided their learners to develop showcase portfolios, negatively influencing the aim of monitoring learners' progress over time and hindering the promotion of creativity among learners. The findings are also supported by Macheso, Wafula & Kati (2024) who investigated teacher efficacy and the implementation of Competency-Based Assessment (CBA) in Western Kenya and found a positive moderate correlation between teacher efficacy and the implementation of CBA, suggesting that teachers' confidence and competence in using assessment tools, including portfolios, are crucial for effective assessment practices.

The researcher further used inferential statistics, the Chi-Square test, to analyse the hypothesis. Hypothesis one stated:

$H_0 1$*: There is no significant relationship between head teacher portfolio appraisal practices and learner Mathematics achievement in public primary schools in Kisumu County*

To test objective one Chi-square test was done to determine the relationship between Head teacher portfolio appraisal practices (M=3.91, SD=0.896) and learner Mathematics achievement (M=4.24, SD=0.499)

Table 2 shows the Chi-square test between head teacher portfolio appraisal practices and learner Mathematics achievement

Table 2: Chi Square test between head teacher portfolio appraisal practices and learner Mathematics achievement

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	53.543[a]	6	.000
Likelihood Ratio	61.450	6	.000
Linear-by-Linear Association	.074	1	.785
N of Valid Cases	78		

a. 5 cells (41.7%) have expected count less than 5. The minimum expected count is .09.

The Chi-square result in Table 2 confirms that there is a relationship between Head teacher portfolio appraisal practices and learner Mathematics achievement. Objective 1 was tested using Chi square (df=6, Pearson Chi square($\chi 2$) =53.543 and p=0.000 at 0.05 level of significance. This shows there is a relationship between Head teacher portfolio appraisal practices and learner Mathematics achievement. This means that the Head teacher's portfolio appraisal practices have a great influence on the learner's Mathematics achievement. These findings are in line with Kimeli and Letangule (2021), who assessed the influence of Teacher Performance Appraisal and Development (TPAD) implementation on secondary students' examination scores in public schools and indicated that effective implementation of TPAD positively impacted students' academic performance, suggesting that structured appraisal systems can enhance educational outcomes. The findings are also supported by Akosah, Yarhands, and Obeng (2024) who investigated how teachers' self-efficacy mediates the relationship between realistic mathematics education and learners' mathematics achievement and found that implementing realistic mathematics teaching methods directly enhances students' mathematical achievement, and that teachers' self-efficacy positively impacts this relationship which underscores the importance of teacher confidence and instructional approaches in student success.

The Head teachers were interviewed on Head teacher portfolio appraisal practices and learner Mathematics achievement coded as H1-H5. Their responses were as follows:

Through appraisals, teachers adopt more learner-centered teaching approaches, leading to greater engagement and improved understanding of Mathematics concepts (School Head teacher 1, 2024).

We experience challenges such as teachers perceiving appraisals as punitive rather than developmental, a lack of balancing appraisal duties with administrative responsibilities, which limits the depth and frequency of appraisals, and a lack of necessary skills for effective appraisal of Mathematics teachers. (School Head teacher 2, 2024).

Consistent portfolio appraisals contributed to better learner performance by enhancing teacher effectiveness (School Head teacher 3, 2024).

Appraisals often reveal gaps in resources, prompting us to supply textbooks, teaching aids, and technological tools to improve Mathematics teaching (School Head teacher 4, 2024).

Pairing less experienced Mathematics teachers with seasoned educators and rewarding teachers with exemplary portfolios motivates teachers to improve their teaching in mathematics (School Head teacher 5, 2024).

From the above Head teachers' responses, we can imply that the Head teacher portfolio appraisal practices significantly influence learner Mathematics achievement, although challenges such as resource limitations, teacher resistance, and administrative workload occasionally hinder their full effectiveness.

The Curriculum Support Officers (CSO) were interviewed on Head Teacher portfolio appraisal practices and learner Mathematics achievement coded as CSO1-CSO7. Their responses were as follows:

CSO1:

"Portfolio appraisals provide a holistic view of a learner's progress over time, capturing their strengths, areas of growth, and consistency in mastering mathematical concepts, which can significantly influence their overall achievement."

CSO2:

"By including a variety of student work, such as problem-solving tasks, reflections, and project-based assignments, portfolios enable teachers to assess not just final outcomes but also the learning process, encouraging deeper engagement with mathematics."

CSO3:

"The challenge with portfolio appraisals is ensuring that they are consistently implemented across different classrooms. There must be a clear framework and guidelines to maintain objectivity in assessing students' portfolios."

CSO4:

"Ongoing feedback is critical in portfolio assessments. Teachers must regularly review and provide constructive feedback on students' work, which helps in correcting mistakes and guiding learners toward mathematical mastery."

CSO5:

"One of the key strengths of portfolio appraisals is that they encourage students to take ownership of their learning and track their own progress, which fosters a deeper understanding and a more independent approach to solving mathematical problems."

CSO6:

"While portfolio appraisals offer valuable insights, they can be time-consuming for teachers to assess, particularly in large classes, and may require additional resources for effective implementation."

CSO7:

"To maximize the effectiveness of portfolio appraisals in improving mathematics achievement, it is important that teachers receive training on how to evaluate portfolios in a way that accurately reflects students' mathematical understanding and progress."

From the responses above of Curriculum Support Officers, we can imply that Head teacher portfolio appraisal practices influences learners' mathematical achievement which are evident by offering a holistic view of learners' strengths, growth areas, and engagement with mathematical concepts and allow for the assessment of both the learning process and final outcomes, encouraging deeper student involvement and ownership of their learning. However, challenges such as ensuring consistency across classrooms, the time required for assessment, and the need for teacher training and resources remain. Effective implementation of portfolio appraisals requires clear frameworks, regular feedback, and adequate support to maximize their impact on learners' mathematical achievement

The Quality Assurance and Standards Officers (QASO) were interviewed on Head Teacher portfolio appraisal practices and learner Mathematics achievement. His response was as follows:

"Head teacher portfolio appraisals provide a comprehensive way to track a learner's progress over time, particularly in mathematics, by showcasing a range of student work that reflects their conceptual understanding and problem-solving abilities. However, for this tool to be effective, it's important that head teachers ensure consistent and objective implementation, supported by clear criteria and regular feedback. Proper training for teachers in portfolio assessment is crucial to ensure its alignment with curriculum goals and to provide meaningful insights into students' achievements."

7. Conclusion

We can conclude:

- Head teachers' portfolio appraisal practices have a great influence on learner mathematics achievement. Learner mathematics can be greatly impacted by the portfolio appraisal procedures used by head teachers. In the end, better student learning and comprehension can result from faculty conversations,

student reflection, and the identification of curriculum gaps brought about by effective portfolio appraisals. By highlighting discrepancies between the planned curriculum and its actual implementation, portfolios can assist guarantee that instruction is in line with the intended learning objectives.

8. Recommendation

The following recommendations were made from the study:

- Regular monitoring and evaluation of portfolio appraisal practices should be conducted by head teachers to assess their effectiveness in improving teaching and learning outcomes in mathematics and periodically review the progress of portfolio implementation and adjust where necessary.
- Head teachers should create a school culture that values growth, learning, and constructive feedback, where portfolio appraisal is not seen as punitive but as an opportunity for professional development.
- Head teachers should use data from portfolio appraisals to make informed decisions about teaching methods, instructional resources, and student interventions in mathematics. Data from these appraisals can also inform school-wide strategies to enhance mathematics performance
- The Ministry of Education and Teachers Service Commission should ensure that adequate resources (such as time, training, and materials) are available for both teachers and head teachers to engage in meaningful portfolio appraisal practices
- Head teachers should encourage and establish collaborative professional learning communities where teachers can share insights, strategies, and challenges in teaching mathematics.
- The Teachers Service Commission and KEMI should ensure Head teachers receive continuous professional development and leadership training focused on supervisory practices, particularly on how to effectively use portfolio appraisal to improve teaching and learning in mathematics.

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