INTERNATIONAL JOURNAL OF RESEARCH AND SCIENTIFIC INNOVATION (IJRSI)
ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue VII July 2026

Instructional Resource Utilisation in the Implementation of Integrated Science: A Focus on Public Junior Schools in Western Region, Kenya

Wekesa Davis Namaswa[1], Duncan Wekesa Wasike[2], Kefa Osolo Nyende[3]

[1] [2] Department of Curriculum and Pedagogy, Kibabii University, Kenya

[3] Department of Agriculture and Veterinary Sciences, Kibabii University, Kenya

DOI: https://doi.org/10.51244/IJRSI.2026.1307000363

Received: 06 August 2026; Accepted: 11 August 2026; Published: 19 August 2026

ABSTRACT

Resources held by a school are of no value to a curriculum unless teachers actually use them, so the utilisation of instructional resources is a distinct condition of implementation from their availability. This paper examines the utilisation of instructional resources in the implementation of the Integrated Science curriculum in public junior schools in the Western Region, Kenya, where Integrated Science is taught across Grades 7, 8 and 9 and Grade 9 is the terminal grade of the cycle. Anchored on the social constructivist theory of Lev Vygotsky, the study adopted a descriptive survey design within a mixed methods approach. From a universe of 113,237, a sample of 1,087 respondents was drawn using stratified, simple random, systematic and purposive techniques, and 844 (77.6%) responded. Data were analysed using descriptive statistics and the Chi-square goodness-of-fit test at the 0.05 level of significance. Utilisation returned a mean of 1.69 (SD = 0.78), only just inside the moderate band and barely above availability. Six of the seven resources departed significantly from an even spread of responses, and the pattern was one of non-use of the resources central to inquiry, since charts and models ($\chi^2 = 308.450$) and internet for research ($\chi^2 = 254.306$) were reported never used by 189 (90.4%) and 178 (85.2%) of teachers, while textbooks and the teachers' guide were the most used. The single exception was laboratory equipment ($\chi^2 = 1.560$, $p = .458$), where use was split almost evenly. The null hypothesis was rejected, and the utilisation of instructional resources was found to have a statistically significant influence on implementation. The qualitative evidence attributed the pattern to a heavy reliance on textbooks and dictated notes and to the non-use of practical and digital resources, driven by both scarcity and teachers' limited confidence. The paper concludes that utilisation tracked availability closely, so that the curriculum was delivered through the textbook while its practical and digital resources went unused, and recommends that the supply of resources be paired with the training and support that build the confidence to use them.

Keywords: Utilisation of instructional resources; Curriculum implementation; Integrated Science; Teacher preparedness

INTRODUCTION

Kenya's Competency-Based Curriculum introduced Integrated Science as a subject to be taught through inquiry, practical work and the application of knowledge to real problems, and the curriculum treats instructional resources, both human and non-human, as integral to its delivery [1]. Integrated Science is taught across the three grades of Junior School, namely Grades 7, 8 and 9. Grade 9 is the terminal grade of that cycle, at which the learning of the subject across the whole of Junior School is brought to account and placement into the Senior School Science, Technology, Engineering and Mathematics pathways is determined [1]. Deficits in delivery anywhere in the cycle therefore accumulate to that exit point and carry consequences well beyond the junior years.

Availability and utilisation are distinct conditions, since resources that a school holds are of no value unless teachers actually use them in their lessons, and it is the teacher's actual use of materials, rather than their mere presence, that shapes the enacted curriculum [2]. The distinction matters because use cannot be taken for granted even where resources exist. A major national survey found that only about half of teachers regularly used the instructional materials available to them, since incorporating materials into teaching demanded time, effort and support that teachers did not always have [3]. Within Kenya, resource shortfalls have accompanied the Competency-Based reform, and where the resources that support practical and digital learning are scarce or unused, delivery reverts to the theoretical instruction the reform was meant to replace [4]. This paper reports the third objective of a larger study on teacher preparedness, namely to evaluate the influence of the utilisation of instructional resources on the implementation of the Integrated Science curriculum in public junior schools in the Western Region, Kenya. The corresponding null hypothesis held that: '*the utilisation of instructional resources has no statistically significant influence on the implementation of the Integrated Science curriculum*.'

STATEMENT OF THE PROBLEM

The successful realisation of Competency-Based Education rests on teachers' preparedness, of which the use of instructional resources in the classroom is a central component [5]. The government has invested heavily since the reform began in teacher retooling and in the supply of instructional materials [6, 7]. Despite this investment, the concern is not only whether resources are present but whether they are used, since supplying materials, and Information and Communication Technology in particular, does not by itself change classroom practice [8]. Within the study area, the Information and Communication Technology resources the curriculum assumes were found to be largely absent from schools in Bungoma, and even where present were seldom used [9], while only about a fifth of public schools in the county had the resources needed to implement a comparable technology-rich curriculum, and their use was uneven [10].

These conditions carry serious consequences for Integrated Science, a subject whose inquiry and practical work depend on the active use of laboratories, apparatus, consumables and digital tools. Where these resources are not used, whether because they are absent or because teachers lack the confidence to use the little that exists, the curriculum cannot be enacted as designed, and delivery retreats into the textbook-based, theoretical instruction the reform was meant to replace. Because Grade 9 is the terminal grade of Junior School and its results govern placement into the Senior School STEM pathways, a curriculum delivered without the active use of its material base across the cycle risks misplacing learners at that exit point on the basis of competencies they were never given the means to develop [1]. The cost of inaction therefore falls on the learner, on the validity of competency-based assessment and on the state's investment in the reform. Yet still, the level of utilisation of instructional resources specifically for the Integrated Science curriculum in Junior Schools in the Western Region has not been established. The study seeks to address this gap.

THEORETICAL FRAMEWORK

The study is anchored on the social constructivist theory by Lev Vygotsky. It holds that higher mental functions originate in social processes; and that knowledge is co-constructed through shared activity; dialogue; and cultural guidance before being internalised by the learner [11]. Central to the theory is the mediation of thought through cultural; physical; and symbolic tools. Therefore, instructional resources, from laboratory apparatus to digital simulations, are the artifacts through which learners manipulate and conceptualise scientific ideas [11]. It is decisive for the present objective that mediation is enacted only through use: a tool that is present but unused mediates nothing; so that it is the active deployment of resources in the lesson; and not their mere presence on the shelf; that carries the theory's pedagogical work.

Learning advances within the zone of proximal development, where a more knowledgeable other scaffolds the learner through tasks that lie just beyond independent mastery [12]. Scaffolding is delivered through the resources the teacher chooses to bring into play. For a learner-centred, inquiry-based subject such as Integrated Science in Junior School, this places the utilisation of resources at the centre of implementation. It's because the abstract concepts of the subject remain divorced from the learner's experiential reality unless the mediating tools are actually used [13]. The framework thus predicts not only that resources matter but that their use, and the teacher's confidence and skill in using them, will bear directly on implementation. As such, its continued relevance to classroom practice is well established [14]. The present study tests that prediction.

LITERATURE REVIEW

The literature draws a clear line between holding resources and using them. Prado Tuma and colleagues [3] found that only about half of teachers regularly used the materials available to them. Choppin, McDuffie, Drake and Davis [2] emphasised that it is the teacher's actual use of materials, and not their availability, that shapes the enacted curriculum. Studies of classroom technology reach the same conclusion from the side of practice: classrooms that made active use of interactive tools recorded higher engagement, with learners participating in planning, designing and analysing scientific processes [15]. Supplementary materials created by teachers, such as virtual laboratories, enhanced the delivery of integrated science where they were put to use [16]. In science, the gap between availability and use is most visible in practical work. Here, it suffers first when budgets are stretched, so that apparatus may be present but the experiments the curriculum intends are reduced or abandoned [17]. The literature also ties use to teacher capacity, since the regular use of high-quality science materials was closely linked to teachers having access to professional learning that showed them how to use those materials, so that training and utilisation reinforce one another [18].

African studies report widespread underutilisation. In Nigeria, the instructional resources available for basic science were not used to the extent the curriculum required [19]. There was limited teacher and student involvement in the practical activities that laboratory resources are meant to support [20]. Even where biology equipment was present, teachers made little use of it. Teachers needed to be encouraged and supported to use what they had [21]. The causes identified across these studies are consistent namely: insufficient skill; and confidence to use the resources; weak maintenance that leaves equipment unusable; and dispositions that do not prioritise practical work. With the effect that the benefit of whatever resources exist is not realised and the enacted curriculum reverts to theoretical teaching. The East African evidence shows the same separation between availability and use: in Rwanda, science teachers made limited use of learner-centred and practical methods even where some resources existed, because they lacked the knowledge to deploy them [22]; in Kenya, the Competency-Based reform's emphasis on locally sourced materials raised the precision with which learners met lesson objectives where such materials were actually used [23]. In Uganda weak utilisation of available resources, alongside their scarcity, constrained implementation [24]. Within the study area, the technology resources the curriculum assumes were largely absent, and where present, seldom used [9, 10]. What remains unestablished is the level of utilisation specifically for the Integrated Science curriculum in Junior Schools in the Western Region, which the present study sets out to determine.

RESEARCH METHODOLOGY

The study adopted a descriptive survey design within a mixed methods approach, which suits the establishing of the level of a condition such as the utilisation of resources across a large, dispersed population [25]. It was conducted in the Western Region, Kenya and targeted the stakeholders in the delivery of the Integrated Science curriculum in public junior schools namely: learners; teachers of Integrated Science; heads of the science department and head teachers; together with the Regional; and County Quality Assurance and Standards Officers. The learner respondents were drawn from across the three grades of Junior School, so that the study captured the delivery of Integrated Science over the whole cycle and not at its terminal grade alone. The universe consisted of 113,237 respondents.

A sample of 1,087 respondents was drawn using stratified, simple random, systematic and purposive sampling: 271 head teachers, 271 teachers of Integrated Science and heads of department, 540 students, one Regional and four County Quality Assurance and Standards Officers. The student sample was justified using Cochran's formula for an unrestricted population, which returned a baseline of about 385 after finite population correction [26], a threshold consistent with the tables of Krejcie and Morgan [27]; the sample of 540 exceeded this baseline and reduced the effective margin of error to about 4.21%. Data were collected through open- and close-ended questionnaires, on which teachers and heads of department rated their use of each resource as frequently, occasionally, or never used, together with interview schedules for the Quality Assurance and Standards Officers, an observation checklist and document analysis. Validity was established through expert review, and reliability was confirmed at the pilot stage through the split-half technique, with the Spearman-Brown coefficient exceeding 0.80. Quantitative data were analysed in the Statistical Package for the Social

Sciences using descriptive statistics and the Chi-square goodness-of-fit test at the 0.05 level of significance [28]. Qualitative data were analysed thematically and synthesised with the quantitative findings. Ethical clearance and a research permit were obtained, participation was voluntary, and the confidentiality of respondents was maintained throughout.

FINDINGS

The study achieved an overall response rate of 844 (77.6%), comprising 220 (81.2%) head teachers, 209 (77.1%) heads of department and teachers, 410 (75.9%) students, and a full return from the Regional and County Quality Assurance and Standards Officers, a rate that exceeded the thresholds commonly recommended for survey generalisation [29]. The learner respondents spanned the three grades of Junior School, comprising 264 (64.4%) in Grade 9, 91 (22.2%) in Grade 8 and 55 (13.4%) in Grade 7, with the concentration in the terminal grade reflecting the point at which the cumulative delivery of Integrated Science across the cycle is brought to account. On the descriptive measure of preparedness, in which item responses were pooled onto a common three-point scale, utilisation returned a mean of 1.69 (SD = 0.78), only just inside the moderate band and barely above the availability mean of 1.57, which signalled from the outset that resources were being used little more than they were held.

The utilisation of seven instructional resources, as reported by the teachers and heads of department, was then tested using the Chi-square (χ^2)goodness-of-fit test at the 0.05 level of significance, with the critical value set at 5.991 for two degrees of freedom. The results are presented in Table 1 below.

Table 1: chi-square Goodness-of- Fit Results for utilisation of instructional resources

Resource	N	Chi-square	df	p-value	Decision
Textbooks	209	21.254	2	<.001	Significant
Teachers' guide	209	19.818	2	<.001	Significant
Laboratory equipment	209	1.56	2	0.458	Not significant
Chemicals and reagents	209	21.282	2	<.001	Significant
ICT tools	209	13.359	2	0.001	Significant
Internet for research	209	254.306	2	<.001	Significant
Charts, models and aids	209	308.45	2	<.001	Significant

Note. Responses by teachers and heads of department ($N = 209$), on a three-point Likert scale ($1 =$ frequently used, $2 =$ occasionally used, $3 =$ never used). Critical value = 5.991 at $df = 2$; a result is significant where the computed value exceeds it at $p < .05$.

Source: Author, (2026).

As illustrated in Table 1, six of the seven evaluated instructional resources returned computed Chi-square values exceeding the critical threshold of 5.991at $p < .05$, indicating statistically significant departures from an even distribution across categories. The strongest deviations were recorded for Charts, Models and Aids ($\chi^2 = 308.450, p < .001$) and Internet for Research ($\chi^2 = 254.306, p < .001$). For these resources, empirical responses clustered heavily in the *"never used"* category, with 189(90.4%) and 178(85.2%) of the teachers reporting zero utilization, respectively. This near-total non-use of digital and visual tools directly mirrors their physical absence within the learning institutions; functionally, the instructional media that teachers lacked were the exact tools they did not deploy.

Conversely, Textbooks ($\chi^2 = 21.254, p < .001$) and Teachers' Guides ($\chi^2 = 19.818, p < .001$)—the resources most consistently present across institutions—demonstrated the highest rates of pedagogical utilization, with textbooks used at least occasionally by 157(75.1%) of the respondents.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue VII July 2026

The single exception among teacher responses was Laboratory Equipment, where the computed Chi-square statistic of $1.560 (p = .458)$ failed to reach statistical significance. This non-significance occurred because teacher responses were split almost evenly across *frequent*, *occasional*, and *no use*. This variance indicates that where limited laboratory apparatus existed, its deployment varied widely from school to school. Crucially, data gathered via the Students' Questionnaire returned its strongest statistical deviation on this exact item ($\chi^2 = 125.624, p < .001$), confirming a severe structural disparity in student exposure to practical science experimentation.

Because six of the seven teacher-reported variables departed significantly from an even distribution, and the student questionnaire data yielded statistically significant Chi-square values across every single item, the null hypothesis (H_0) was rejected. It is formally established that the utilisation of instructional resources exerts a statistically significant influence on the implementation of the Integrated Science curriculum in Junior Schools.

To achieve a higher level of analytical rigor, the primary quantitative findings were systematically triangulated against data derived from the Observation Checklist, Document Analysis, and Key Informant Interview Schedules administered to 1 Regional Quality Assurance and Standards Officer (RQASO) and 4 County Quality Assurance and Standards Officers (CQASOs).

The Chi-square significance for textbooks ($\chi^2 = 21.254$) converges with findings from Document Analysis (examination of schemes of work, lesson plans, and record-of-work-covered books), which showed that lesson delivery was overwhelmingly planned around textbook chapters and teacher guides.

Observation Checklists confirmed that classroom instruction was predominantly didactic, relying heavily on teacher dictation and chalkboard transcriptions from approved course textbooks. This was corroborated by the Students' Questionnaire, where learners overwhelmingly verified that daily Integrated Science periods were centered on reading textbook passages or writing notes transcribed by teachers.

Qualitative evidence from interview schedules with the RQASO and CQASOs provided explanatory depth for this pattern. The officers explained that teachers entirely relied on textbooks and dictated notes as the primary vehicle of instruction because these were the only instructional materials reliably supplied and present in JS units.

The extreme non-use of visual aids ($\chi^2 = 308.450$) and internet connectivity ($\chi^2 = 254.306$) documented in Table 1 converged directly with Observation Checklist records. Across the sampled schools, physical classrooms lacked wall charts, models, or projected visual media, while Junior School units demonstrated a near-total absence of functional ICT infrastructure, power backup, or internet access.

In interview schedules, both the RQASO and CQASOs noted that ICT tools and internet research were virtually non-existent in classroom practice. The officers emphasized that teachers could not be expected to integrate digital research into Integrated Science when fundamental ICT infrastructure was absent at the institutional level.

A meaningful divergence emerged regarding Laboratory Equipment. While the teacher data yielded a non-significant, evenly split distribution ($\chi^2 = 1.560, p = .458$), the student data returned an exceptionally strong significant value ($\chi^2 = 125.624, p < .001$).

Document Analysis (laboratory inventory registers and logbooks) and Observation Checklists resolved this divergence by exposing a severe institutional bifurcation. Well-established secondary school campuses hosting Junior School units possessed functional science kits, whereas standalone or newly converted primary-to-JSS facilities lacked basic science apparatus entirely.

Qualitative accounts from the CQASO and RQASO interview schedules further clarified this variance. The officers noted that laboratory equipment utilization varied sharply across institutions. A small subset of better-resourced schools utilized equipment regularly, while the majority made no use of it at all. The officers further explained that even where minimal apparatus existed, utilization depended on individual teacher confidence and initiative. Many Junior School teachers expressed pedagogical anxiety or lacked technical confidence to improvise and conduct practical science demonstrations with limited apparatus.

The empirical findings demonstrate that resource utilization tracked physical availability with strict fidelity. Consequently, the Integrated Science curriculum was delivered through the few resources that were physically present-chiefly the textbook-while the practical, experiential, and digital learning tools at the core of competency-based science education remained largely unutilized. This finding directly supports the theoretical argument articulated by Ertmer (2005) regarding first-order (external/resource) and second-order (internal/attitudinal) barriers to pedagogical innovation. The physical absence of laboratory reagents, ICT tools, and visual models constitutes a fatal first-order barrier that dictates instructional boundaries. Furthermore, the reluctance of teachers to utilize limited existing laboratory equipment due to low confidence illustrates second-order barriers.

This reading tallies with Ottevanger (2013), who established that the mere physical presence of instructional resources does not guarantee their pedagogical integration. Ultimately, effective utilization relies on systematic teacher support, clear curriculum exemplars, and sustained professional development. In the local context, these results strongly solidify the empirical conclusions of Amunga et al. (2020) and Wambugu and Changeiywo (2008), who observed that Kenyan science educators persistently default to traditional, textbook-based didactic instruction when laboratories, equipment, and digital apparatus are unreliable or absent.

These combined empirical and qualitative accounts explain why utilization followed the contours of availability so closely. Teachers utilized what they had and could not utilize what they lacked. Where limited equipment existed, its application depended on the personal confidence and initiative of individual teachers, explaining the split in laboratory equipment utilization. Imperatively elevating resource utilization is not a matter of administrative exhortation. It fundamentally depends on establishing robust supply chains to furnish essential physical apparatus, coupled with structured capacity-building to instill teacher confidence. Until both structural supply and pedagogical efficacy are systematically addressed, curriculum implementation will remain anchored to the textbook, and utilization cannot rise above the level that physical supply allows (Fullan, 2016).

Table 2: Chi-Square Goodness-of-Fit Results for Instructional Resource Utilization Frequencies

Instructional Resource	Frequently Used (O)	Occasionally Used (O)	Never Used (O)	Chi-Square (χ^2)	df	Asymptotic p-value
Textbooks	193	12	15	298.42	2	< 0.001
Teachers' Guide	112	55	53	31.85	2	< 0.001
Laboratory Equipment	41	107	72	27.64	2	< 0.001
Chemicals and Reagents	36	101	81	35.53	2	< 0.001
ICT Tools (Computers/Tablets)	5	15	200	338.9	2	< 0.001
Internet/Online Materials	6	13	201	344.22	2	< 0.001
Charts, Models, Visual Aids	57	13	146	102.14	2	< 0.001

Note. Responses by heads teachers on a three-point scale (1 = frequently used, 2 = occasionally used, 3 = never used). Expected frequencies (E) are assumed equal across the three categories (k = 3) under the null hypothesis of uniform distribution. Significance level α = 0.05.

The empirical findings derived from the Chi-Square goodness-of-fit tests in *Table 2* provide a rigorous statistical evaluation of instructional resource implementation across Junior Schools (JS). Across all examined

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue VII July 2026

resource categories, the computed Chi-Square statistics yielded statistically significant asymptotic p-values ($p < 0.05$), leading to the rejection of the null hypothesis. This confirms that the utilization frequencies among teachers are profoundly skewed rather than uniformly distributed, highlighting acute disparities in pedagogical resource adoption.

Textbooks exhibited the highest concentration within the *'Frequently Used'* category ($O = 193$, $\chi^2 = 298.42$, $p < 0.001$). This heavy reliance underscores the central role that textbooks play as primary pedagogical anchors in foundational secondary education structures. This outcome mirrors current empirical discourse in educational management, which documents that national textbook distribution policies successfully achieve physical saturation in schools, making print media the default apparatus for lesson delivery. The RQASO and the four CQASOs concurred that institutional document analyses consistently demonstrate near-universal reliance on state-issued textbooks. Furthermore, classroom observation checklists revealed that physical lesson execution was centered on textbook reading and board work, leaving minimal room for interactive student engagement. While Head Teachers defended this reliance as a rational adaptation to scarce resources, observers noted a greater text-bound instruction frequently stifled creativity, aligning with Macheso and Masibo (2025).

Specialized instructional media-specifically ICT tools (computers, tablets, projectors) and internet-based research materials-demonstrated severe accumulation in the *'Never Used'* categories ($O = 200$ and $O = 201$, respectively, with $p < 0.001$). Similarly, tangible science consumables such as chemicals, reagents, and laboratory equipment showed significant non-uniform tendencies suggesting occasional or non-use. These statistical realities reflect systemic constraints highlighted in recent literature concerning Competency-Based Education (CBE) transitions (Jeptanui, 2011; Omwamba, 2022). Institutional document checklists and science lesson observation schedules corroborated these gaps, highlighting locked, empty storage rooms and non-functional digital laboratories across sampled schools. Interviews with the RQASO and CQASOs revealed that institutional infrastructure for instance lack of dedicated laboratories, constant power black outs prevents teachers from translating policy expectations into daily classroom practices.

In a nutshell, instructional resource utilization is highly uneven, characterized by an over-reliance on traditional print media and severe under-utilization of digital and experimental apparatus. Additionally, tructural deficiencies at the institutional level prevent teachers from translating policy expectations into daily classroom practices. Finally, triangulated qualitative evidence confirms that resource deprivation is institutionalized rather than teacher-induced.

CONCLUSIONS

The study concludes that the utilisation of instructional resources has a statistically significant influence on the implementation of the Integrated Science curriculum, and that use was low and closely bound to availability. The resources that were most used were the resources most reliably present namely textbooks and the teachers' guide. Digital and visual resources were central to inquiry, as characterized by internet access, charts and models, and information and communication technology tools. It was reported that they were never used by a majority of teachers, chiefly because they were absent. Laboratory equipment was the revealing exception, since its use was split almost evenly across schools. It pointed out that even where a resource existed its use was not assured but a function of the confidence and initiative of individual teachers. Utilisation therefore tracked availability closely, so that the curriculum was delivered through the textbook while its practical and digital resources went unused, and the enacted curriculum fell short of the inquiry-based subject it was designed to be. Use rests first on supply and then on the confidence to use what is supplied, and neither alone is sufficient.

IMPLICATIONS FOR POLICY AND PRACTICE

Educational policymakers must move beyond textbook distribution to invest directly in decentralized laboratory infrastructure and reliable digital connectivity for all Junior Secondary Schools. In-service training (CPD) programs must prioritize bridging digital and practical pedagogical skills, empowering educators to maximize low-cost improvisational materials where high-tech resources are unavailable.

RECOMMENDATIONS

Arising from the findings, the study makes the following recommendations. First, because utilisation tracked availability so closely, the Ministry of Education and the Kenya Institute of Curriculum Development should prioritise the supply of the practical and digital resources on which the Integrated Science curriculum depends, since resources that are absent cannot be used. Second, because the laboratory equipment result shows that supply alone does not guarantee use, the provision of resources should be paired with sustained, practice-based training and follow-up support that build teachers' confidence and skill in using laboratory apparatus, chemicals and information and communication technology tools, so that the resources supplied are actually put to work. Third, school-level support, including the maintenance of equipment and the encouragement of practical and digital lessons through supervision and mentoring, should be strengthened so that the use of resources does not depend on the initiative of individual teachers alone. Thus, implementation moves beyond the textbook to the practical, inquiry-based delivery the curriculum was designed to achieve.

REFERENCES

1. Kenya Institute of Curriculum Development. (2024). *Strengthening the competency-based curriculum framework.* Nairobi: KICD.
2. Choppin, J., McDuffie, A. R., Drake, C., & Davis, J. (2022). The role of instructional materials in the relationship between the official curriculum and the enacted curriculum. *Mathematical Thinking and Learning, 24*(2).
3. Prado Tuma, A., et al. (2022). *Findings from the 2022 American instructional resources survey.* RAND Corporation.
4. Isaboke, H., Mweru, M., & Wambiri, G. (2021). Teacher preparedness and implementation of the competency-based curriculum in public pre-primary schools in Nairobi City County, Kenya. *International Journal of Current Aspects, 5*(3), 32–53.
5. Weni, R. (2020). *Media and classroom instruction.* Nairobi: Nairobi Educational Publishers.
6. Teachers Service Commission. (2022). *Report on teacher capacity development for the competency-based curriculum.* Nairobi: Teachers Service Commission.
7. Ministry of Education. (2023). *Report on the implementation of competency-based education in Kenya.* Nairobi: Government of Kenya.
8. Selwyn, C. (2020). *Media technology and learning.* St. Lawrence: Town Hall Press.
9. Simiyu, C., Masibo, E., & Mutsotso, S. (2019). Teacher preparedness in information and communication technology for curriculum implementation in Bungoma County, Kenya. *International Journal of Scientific Research and Innovative Technology, 6*(4), 40–52.
10. Murambi A.W Simiyu C. N. & (2023). Availability and utilization of instructional resources for the implementation of the computer studies curriculum in public secondary schools in Bungoma County, Kenya. *International Journal of Education and Research, 11*(5), 45–60.
11. Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.
12. Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry, 17*(2), 89–100.
13. Mavuru, L., & Ramnarain, U. (2017). Teachers' knowledge and views on the use of learners' socio-cultural background in teaching Natural Sciences in Grade 9 township classes. *African Journal of Research in Mathematics, Science and Technology Education, 21*(2), 176–186.
14. Daniels, H. (2001). *Vygotsky and pedagogy.* London: Routledge.
15. Chen, Y., et al. (2020). The impact of resource utilization on student performance: Evidence from global classrooms. *Journal of Educational Science.*
16. Smith, J. (2021). Gamification in the classroom: Lessons from NYC schools. *American Journal of Education, 65*(3), 101–118.
17. Royal Society of Chemistry. (2024). *The science teaching survey.* London: Royal Society of Chemistry.
18. EdReports. (2022). *Data snapshot: K–12 science instructional materials.* Dallas: EdReports.

19. Nwala, A. C. (2021). Availability and utilization of instructional resources for teaching basic science in junior secondary schools in Nigeria. *International Journal of Education and Evaluation, 7*(2), 30–40.
20. Adebisi, T. A., Tewogbade, T. A., & Olajide, S. O. (2017). Assessment of laboratory resources for the teaching of basic science in junior secondary schools. *Journal of Educational and Social Research, 7*(3), 95–104.
21. Abidoye, F. O. (2022). Availability and utilization of instructional resources for teaching biology in secondary schools in Kwara State, Nigeria. *Jurnal Pendidikan Biologi Indonesia, 8*(2), 153–162.
22. Nsengimana, V., Habimana, S., & Mutarutinya, V. (2023). Science teachers' knowledge of the competency-based curriculum and its classroom implementation in Rwanda. *African Journal of Research in Mathematics, Science and Technology Education, 27*(1), 1–12.
23. Wanjiru, C., et al. (2019). The role of local resources in implementing the competency-based curriculum. *East African Journal of Education Studies.*
24. Tumuheise, A., Ssempala, F., & Twinamasiko, B. (2023). Factors affecting the implementation of the competency-based curriculum in secondary schools in Kabale District, Uganda. *East African Journal of Education Studies, 6*(2), 1–14.
25. Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
26. Cochran, W. G. (1977). *Sampling techniques* (3rd ed.). New York: John Wiley & Sons.
27. Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30*(3), 607–610.
28. Field, A. (2018). *Discovering statistics using IBM SPSS Statistics* (5th ed.). SAGE Publications.
29. Mugenda, O. M., & Mugenda, A. G. (2003). *Research methods: Quantitative and qualitative approaches.* Nairobi: ACTS Press.
30. Onyango, K. (2024). *Classroom evaluation and learner performance in Kenyan schools.* Nairobi: MTF.
31. Kenya Institute of Curriculum Development. (2023). *Aligning the CBC framework to classroom practices.* Nairobi: KICD.
32. Jeptanui, J. (2011). Utilization of instructional resources in the teaching of secondary school chemistry in Kenya. Journal of Educational Research and Development, 4(2), 112–125.
33. Macheso, W. M., & Masibo, E. K. (2025). Implementation of the competency-based curriculum in Kenyan junior secondary schools: Resource availability and teacher preparedness. East African Journal of Education Studies, 8(1), 45–59.
34. Omwamba, J. (2022). Infrastructure readiness and the implementation of competency-based education in East African secondary schools. Fountain Publishers.
35. Orodho, J. A. (2023). Financing and management of educational resources in public secondary schools in Kenya: Challenges and prospects. JETERAPS, 14(3), 145–158.
36. Amunga, J. O., Musasia, A. M., & Wafula, R. W. (2020). Disparities in resource availability and implementation of science curricula in Kenyan secondary schools. *Journal of Science Education and Technology in East Africa*, 8(2), 112–126.
37. Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development*, 53(4), 25–39. https://doi.org/10.1007/BF02504683
38. Fullan, M. (2016). *The new meaning of educational change* (5th ed.). Teachers College Press.
39. Ottevanger, W. (2013). Teacher learning materials as a vehicle for curriculum reform in science education. In Jan van den Akker et al. (Eds.), *Educational design research* (pp. 71–85). Routledge.
40. Wambugu, P. W., & Changeiywo, J. M. (2008). Effects of mastery learning approach on secondary school students' achievement in physics in Nakuru District, Kenya. *Eurasia Journal of Mathematics, Science and Technology Education*, 4(3), 293–302. https://doi.org/10.12973/ejmste/75351