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The Access–Use Gap in Mathematics Instructional Materials: A Comparative Study of Public and Private Primary Schools

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ABSTRACT

This study examined the gap between access to mathematics instructional materials and their classroom use in four selected public and private primary schools in Kabul City. A descriptive–comparative survey involved 211 students and 28 mathematics teachers, using verified frequencies and percentages from the approved master’s thesis. Public-school students reported greater access (73.3%) and classroom use (63.6%) than private-school students (49.4% and 42.5%, respectively), while conversion efficiency was nearly identical (86.8% vs. 86.0%). Teacher and student reports differed across indicators of teacher capacity and participation. Constraints were more prominent in private schools, particularly textbook alignment and limited professional development. The findings emphasize

distinguishing resource availability from classroom use and considering curriculum alignment, teacher support, and student participation when evaluating instructional-material provision.

Keywords: Access–use gap; Afghanistan; instructional materials; mathematics education; primary schools; student engagement; teacher capacity

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INTRODUCTION

Instructional materials are important components of effective mathematics teaching, particularly at the primary level, where learners need concrete, visual, and practical support to understand abstract concepts. Mathematics kits, charts, manipulatives, textbooks, and locally available objects can help teachers transform mathematical ideas into meaningful classroom experiences. In low-resource contexts, active mathematics teaching may also support students' motivation, conceptual understanding, and learning outcomes when classroom activities encourage participation and practical engagement (Enayat et al., 2025). Previous research has shown that educational materials improve learning when they are meaningfully integrated into instruction rather than merely provided to schools (Kul et al., 2018; Schroeder et al., 2007).

However, access to instructional materials does not automatically lead to effective classroom use. Schools may have mathematics kits, textbooks, charts, or other teaching aids, but these resources may remain underused because of limited teacher training, weak curriculum alignment, lack of time, crowded classrooms, or insufficient professional support. This distinction between material availability and pedagogical use is important because educational policies often emphasize resource provision, while less attention is given to whether these resources are actively used in classroom practice. Studies on curriculum implementation and resource inequality show that instructional materials become educationally valuable only when they are connected to teaching practice, teacher decision-making, and classroom realities (Oakes & Saunders, 2002, 2004; Remillard, 2005; Yan & He, 2012).

This issue is especially important in mathematics education, where students often move from concrete experiences to symbolic and abstract reasoning.

Instructional materials can support learning in areas such as number operations, measurement, geometry, patterns, and problem-solving. Yet their effectiveness depends not only on availability, but also on how teachers interpret, adapt, and use them during lessons. Research suggests that teachers do not use curriculum materials mechanically; their knowledge, beliefs, pedagogical skills, and classroom contexts shape how materials are implemented (Ball & Cohen, 1996; Remillard, 2005).

Public and private schools may also differ in instructional resource conditions. In some contexts, public schools benefit from government-supported provision of textbooks and teaching materials, while private schools depend more on school budgets, tuition fees, and institutional decisions. However, public–private differences are not always one-directional. They may be shaped by socioeconomic background, school funding, institutional capacity, household selection, and local education policies (Baum et al., 2018; Gruijters et al., 2021; Romuald, 2023). Therefore, school type alone cannot explain instructional resource conditions; access, classroom use, teacher capacity, student engagement, and structural barriers should be examined together.

Despite the importance of instructional materials in mathematics education, limited research has directly examined the access–use gap, particularly through a comparative analysis of public and private primary schools. Many studies focus on whether schools have resources, but fewer examine whether available materials are converted into classroom practice. This study addresses this gap by examining mathematics instructional materials in public and private primary schools in Kabul City. It focuses on material access, classroom use, teacher capacity, student engagement, structural barriers, and student–teacher report differences.

The study seeks to answer the following research questions:

1. What is the access–use gap in mathematics instructional materials in public and private primary schools?
2. How do public and private schools differ in teacher capacity and student engagement related to instructional material use?
3. What structural barriers limit the effective use of mathematics instructional materials in each school type?
4. To what extent do student and teacher perceptions of instructional material availability and use align or differ?
5. What descriptive pattern emerges when access, classroom use, teacher capacity, student engagement, and structural conditions are considered together?

By addressing these questions, the study contributes to mathematics education research by moving beyond a simple resource-availability perspective. It provides a descriptive framework for understanding how instructional materials function in classroom practice and how school-level conditions shape the conversion of available resources into meaningful mathematics instruction. The

study is also relevant to STEM education because primary mathematics learning provides a foundation for later scientific, technological, and problem-solving competencies.

LITERATURE REVIEW

Instructional Materials in Primary Mathematics Education

Instructional materials are important supports in primary mathematics education because many mathematical concepts are abstract for young learners. Concrete and visual materials such as mathematics kits, charts, manipulatives, textbooks, and locally available objects can help students connect symbols and procedures with real classroom experiences. When used meaningfully, these materials can make mathematics learning more understandable, engaging, and memorable (Kul et al., 2018; Schroeder et al., 2007). Recent meta-analytic evidence also indicates that non-digital tools, including manipulatives, mathematical games, and puzzles, can strengthen mathematical thinking and problem-solving when they are consistently integrated into classroom instruction (Tripo & Debrenti, 2026).

However, instructional materials are not effective simply because they are available in schools. Their value depends on how teachers select, adapt, and use them during lessons. Therefore, instructional materials should be understood not only as physical resources, but also as pedagogical tools that require purposeful classroom implementation. They may also support teacher learning by helping teachers think more deeply about content, pedagogy, and students' mathematical understanding (Ball & Cohen, 1996; Remillard, 2005; Travé González & Pozuelos Estrada, 2017).

From Access to Classroom Use

Access to instructional materials does not necessarily mean that these materials are used effectively in classrooms. Schools may have mathematics kits, textbooks, charts, or other teaching aids, but these resources may remain underused because of limited time, insufficient training, crowded classrooms, weak textbook alignment, or lack of professional support. This distinction between access and use is central to the present study.

The access–use gap refers to the difference between the availability of instructional materials and their actual use in teaching. Previous studies show that unequal access to textbooks and instructional materials can create unequal learning opportunities (Flores, 2007; Oakes & Saunders, 2002, 2004). At the same time, implementation studies suggest that resources become educationally useful only

when they fit classroom realities and teachers are able to use them effectively (Travé González & Pozuelos Estrada, 2017; Yan & He, 2012).

In this study, access is understood through mathematics kit availability, material sufficiency, and material appropriateness. Use is understood through teachers' classroom use of kits, charts/forms, and simple local materials. This approach allows the study to examine not only whether materials are present, but also whether they are translated into classroom practice.

Public–Private Differences in School Resources

Public and private schools may differ in instructional resources, but these differences are not the same in every context. In some settings, private schools may have better infrastructure or stronger institutional support. In other contexts, public schools may benefit from government-supported textbook and material provision. Therefore, public–private differences should not be interpreted as automatically favoring one school type.

Research shows that differences between public and private schools are often shaped by socioeconomic background, school funding, institutional capacity, household selection, and local education policies (Baum et al., 2018; Gruijters et al., 2021; Romuald, 2023). For this reason, comparing school types requires attention to actual classroom conditions, including whether instructional materials are sufficient, appropriate, aligned with curriculum content, visible to students, and used in practice. Studies in developing contexts also suggest that the effect of school resources depends strongly on implementation quality and contextual conditions (Glewwe et al., 2011; León & Valdivia, 2015).

Teacher Capacity, Training, and Student Engagement

Teacher capacity is essential for turning instructional materials into meaningful learning experiences. Even when materials are available, teachers need familiarity, subject knowledge, pedagogical skill, and confidence to use them effectively. Professional development can help teachers select, adapt, and integrate materials into classroom activities, especially in mathematics, where both content knowledge and pedagogical content knowledge are important (Jacob et al., 2017; Koellner et al., 2011). Recent review evidence further suggests that students' interest in mathematics is shaped by teacher-related factors, curriculum relevance, and the quality of instructional materials (Boadu et al., 2026).

However, teacher knowledge alone is not enough. The use of materials also depends on time, classroom conditions, institutional support, and opportunities for students to participate actively. Teachers do not simply follow curriculum materials; rather, they interpret and adapt them according to their knowledge, beliefs, and classroom realities (Ball & Cohen, 1996; Remillard, 2005). Student

engagement is therefore a key part of effective material use. Instructional materials become more meaningful when students are involved in practical activities, discussion, manipulation, observation, and problem-solving. Recent review evidence further shows that joyful and activity-based approaches in elementary mathematics commonly use games, worksheets, and interactive materials to enhance student motivation and participation, although stronger empirical evidence is still needed regarding their effects on learning outcomes (Putra et al., 2026).

Structural Barriers to the Use of Instructional Materials

The use of instructional materials may be limited by several structural barriers. These include insufficient materials, inappropriate materials, weak alignment between materials and textbook content, limited teaching time, crowded classrooms, heavy textbook load, and lack of in-service training. Such barriers can prevent available resources from becoming active teaching and learning tools.

These barriers show that the problem is not only related to teacher willingness or individual ability. Even competent teachers may find it difficult to use instructional materials when classrooms are overcrowded, materials do not match the textbook, or professional support is limited. Studies on educational implementation in resource-constrained contexts show that infrastructure, training, and organizational conditions strongly influence whether educational resources are used effectively (Costan et al., 2021; Frehywot et al., 2013; Yan & He, 2012). In mathematics education, textbook alignment is especially important because teachers may avoid using materials that do not match the topics being taught.

Conceptual Framework

Based on the reviewed literature, this study understands the use of mathematics instructional materials as a multidimensional process. The framework assumes that school type may shape both access to instructional materials and the structural conditions under which teachers work. Public and private schools may differ in material provision, training opportunities, classroom conditions, and curriculum alignment. In this framework, instructional material access refers to the availability, sufficiency, and appropriateness of materials. However, access alone is not enough. Available materials must be converted into actual classroom use through teacher practice. This transition is represented by conversion efficiency, which describes the extent to which reported access is reflected in reported classroom use. Classroom use becomes more meaningful when it is supported by teacher capacity and student engagement. Teacher capacity includes teacher familiarity, skill, and mastery in using instructional materials, while student engagement refers to students' participation in practical and material-based

learning activities. At the same time, structural barriers may weaken this process by limiting teachers’ ability to use materials effectively. These barriers include insufficient materials, inappropriate materials, weak textbook alignment, limited time, crowded classrooms, heavy textbook load, and limited or no in-service training. The framework also includes a student–teacher report comparison as a descriptive dimension. This comparison identifies where teacher reports of material availability and use converge with or differ from students’ classroom experiences. It is not treated as a validation measure or a formal test of agreement.

Overall, the framework suggests that instructional resource inequality should be examined through access, classroom use, teacher capacity, student engagement, structural barriers, and perception alignment. Figure 1 presents the conceptual framework guiding the study. The framework distinguishes access to mathematics instructional materials from their classroom use and situates this relationship within broader instructional dimensions, including teacher capacity, student engagement, structural conditions, and student–teacher report differences.

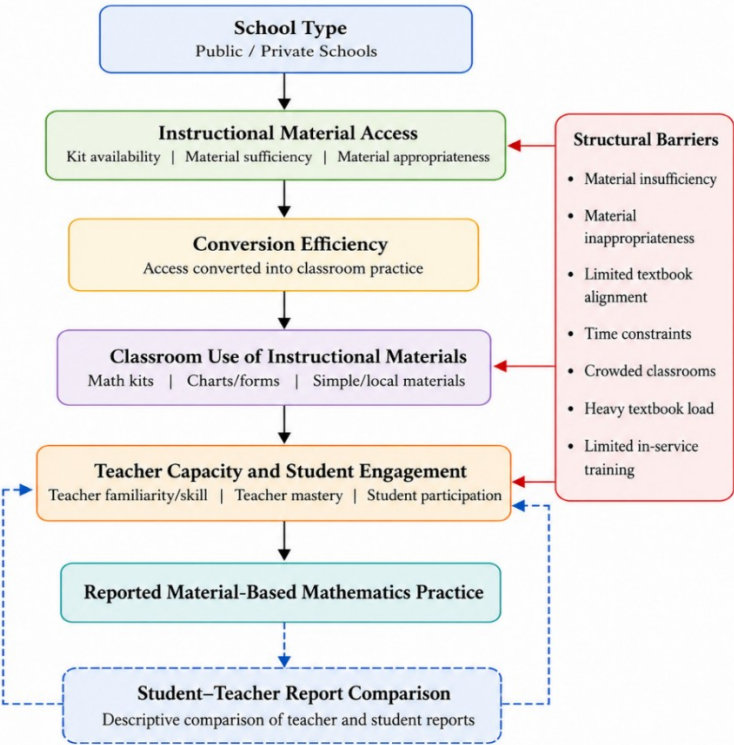


Figure 1
Conceptual Framework of the Access–Use Gap in Mathematics Instructional Materials.

The framework shows how school type is linked to reported access to mathematics instructional materials and their classroom use. Conversion efficiency represents the proportion of reported access reflected in reported use. Teacher capacity and student engagement are included as related instructional dimensions, while structural barriers may influence both access and classroom implementation. Student-teacher report comparison is used as a descriptive dimension rather than a formal test of agreement.

RESEARCH METHOD

Research Design

This study employed a descriptive-comparative, cross-sectional survey design to examine the reported availability and classroom use of mathematics instructional materials in selected public and private primary schools. The design was appropriate because the study aimed to describe existing conditions and compare reported patterns of access, use, teacher capacity, student engagement, and implementation barriers across the two school types. Data were collected at one point in time from primary-school students and mathematics teachers; therefore, the study was not designed to establish causal relationships.

The article was developed from an approved master's thesis on the use of mathematics instructional materials in public and private primary schools in Kabul City¹. The present analysis therefore relied on the verified aggregated results reported in the thesis. No individual-level responses were estimated or reconstructed, and the findings are interpreted as descriptive comparisons limited to the participating schools.

Study Setting and School Type

The study was conducted in the third educational district of Kabul City, Afghanistan. The target population comprised primary-school students and mathematics teachers in public and private schools within the district. Four schools were included in the study: two public schools and two private schools. All mathematics teachers working in the four participating schools were included in the teacher sample. For the student sample, quota allocation was used to assign a larger share of participants to schools with larger student enrolments, after which students were selected randomly within the allocated quotas. This approach produced unequal numbers of participants across school types because the selected

¹ The original electronic Excel/SPSS dataset had been lost and could not be recovered at the time of manuscript revision and publication. However, the approved thesis retained detailed item-level tables containing raw frequencies and percentages for public- and private-school respondents. For transparency purposes, please refer the following document: <https://doi.org/10.5281/zenodo.21990925>

public schools had substantially larger student populations than the selected private schools. The schools represented a limited case sample from one educational district rather than a probability sample of all schools in Kabul City. Therefore, comparisons in this study refer only to the participating schools and should not be generalized to all public and private schools in Kabul or Afghanistan.

Participants

The study included 239 participants from four selected primary schools, comprising 211 students and 28 mathematics teachers. Of the student participants, 182 attended the two selected public schools, and 29 attended the two selected private schools. The teacher sample consisted of 21 mathematics teachers from public schools and 7 mathematics teachers from private schools. Students were included because they could report their classroom experiences regarding the availability, visibility, and use of mathematics instructional materials. Mathematics teachers provided information about material availability, classroom use, professional capacity, training opportunities, student participation, and barriers to implementation.

Research Instruments

Data in the original study were collected using two researcher-developed questionnaires: one administered to primary-school students and the other to mathematics teachers. The instruments were designed to obtain complementary perspectives on the availability and classroom use of mathematics instructional materials. Most substantive items used a five-point response format ranging from very high to very low, while selected questions, such as the availability of a mathematics kit, used categorical response options. The questionnaires are reproduced in the appendices of the approved thesis.

Student Questionnaire

The student questionnaire collected demographic information on sex and grade level and examined students' reported classroom experiences with mathematics instructional materials. The questionnaire covered the availability of mathematics kits; the sufficiency and appropriateness of instructional materials; teachers' use of mathematics kits, charts, visual forms, and simple locally available materials; teachers' familiarity, skill, and mastery in using instructional materials; alignment between the materials and mathematics textbook content; student participation in material-based activities; and the frequency of practical classroom activities. Student responses were used to describe the extent to which instructional materials were visible, available, and used in classroom practice.

Teacher Questionnaire

The teacher questionnaire collected background information on sex, educational level, field of study, and teaching experience. Its substantive items examined the availability and use of mathematics instructional materials, teachers' knowledge and perceived competence, the instructional value of the materials, student participation, and barriers affecting classroom implementation. The barrier-related items addressed time limitations, material sufficiency and appropriateness, alignment with mathematics textbook content, crowded classrooms, heavy textbook load, and access to in-service training.

Instrument Validity and Reliability

The questionnaires were developed by the original researcher and reviewed by specialists in education. According to the thesis, preliminary versions of the instruments were submitted to relevant experts, and revisions were made based on their feedback under the supervision of the thesis advisor. This process supported the face and content relevance of the questionnaire items. The original thesis also reported an overall Cronbach's alpha coefficient of .83 for the questionnaire items. However, the surviving research records do not provide separate reliability coefficients for the student and teacher questionnaires or for the composite indicators constructed in the present article. Therefore, the reported alpha should be interpreted as an overall reliability estimate from the original study and not as evidence that each retrospectively constructed composite measure was independently validated.

Descriptive Indicators and Item-Level Comparisons

The item-level frequencies and percentages preserved in the approved thesis were used to examine reported access to mathematics instructional materials, their classroom use, teacher capacity, student engagement, structural conditions, and differences between student and teacher reports. Because the original individual-level dataset was unavailable, no participant-level scale scores were calculated. Aggregated summary indicators were calculated only for access and classroom use. The access-use gap and conversion efficiency were then derived from these two summaries. Teacher capacity, student engagement, structural conditions, and student-teacher differences were examined at the item level using the verified raw frequencies and percentages reported separately for public and private schools. All results were used for descriptive comparison only and should not be interpreted as validated psychometric scales or population-level estimates.

Access Summary

The access summary represented students' reported access to mathematics instructional materials. It was calculated from three indicators: mathematics kit availability, material sufficiency, and material appropriateness. For mathematics kit availability, the percentage of students responding "yes" was used. For material sufficiency and appropriateness, the percentages of "very high" and "high" responses were combined. The three percentages were then averaged with equal weighting.

Use Summary

The use summary represented students' reports of how frequently mathematics instructional materials were used during lessons. It included teachers' use of mathematics kits, charts or visual forms, and simple materials available in the local environment. For each item, the "very high" and "high" response categories were combined, and the resulting percentages were averaged with equal weighting.

Access–Use Gap

The access–use gap represented the numerical difference between reported access to instructional materials and their reported classroom use. It was calculated as follows:

$$\text{Access–Use Gap} = \text{Access Summary} - \text{Use Summary}$$

A positive value indicated that reported access was higher than reported classroom use. The result was interpreted only as a descriptive difference in percentage points.

Conversion Efficiency

Conversion efficiency described the proportion of reported access that was reflected in reported classroom use. It was calculated as follows:

$$\text{Conversion Efficiency} = \text{Use Summary} \div \text{Access Summary} \times 100$$

The calculation used the unrounded access and use summary values. This ratio was used only for descriptive comparison between the participating public and private schools. It should not be interpreted as a causal estimate, a measure of teacher effectiveness, or a statistically validated efficiency scale.

Item-Level Descriptive Comparisons

Teacher capacity, student engagement, structural conditions, and student–teacher differences were examined at the item level rather than through overall composite scores. For positively worded five-point items, the “very high” and “high” response categories were combined when describing strong capacity, participation, or classroom use. Where positively worded items were examined as possible constraints, “moderate,” “low,” and “very low” responses were combined to indicate that the condition had not been rated high or very high. For directly worded constraint items, “very high” and “high” responses were combined. Student and teacher reports were compared descriptively for indicators shared by the two questionnaires, including mathematics kit availability, classroom use of instructional materials, teacher familiarity and mastery, and student participation. The teacher-reported percentage minus the student-reported percentage was used to show the direction and size of each descriptive difference. Because students and teachers were separate respondent groups, these comparisons were not treated as matched observations or formal tests of agreement.

Data Collection Procedure

In the original study, data were collected from the selected public and private schools using the student and teacher questionnaires. Students completed the questionnaire based on their classroom experiences, while mathematics teachers completed the questionnaire based on their use of instructional materials, training experience, and perceived implementation barriers. After data collection, the questionnaire responses were organized and summarized in the original thesis through frequencies, percentages, tables, and graphs.

Data Analysis

The master’s thesis from the first author analyzed the questionnaire responses using SPSS and Microsoft Excel and presented the results through frequencies, percentages, tables, and graphs. These aggregated results were extracted separately for public- and private-school respondents and used to verify the sample structure and reported descriptive findings. The access and use summaries were calculated from the relevant aggregated item percentages. The access–use gap was obtained by subtracting the use summary from the access summary, while conversion efficiency was calculated by dividing the use summary by the access summary and multiplying the result by 100. Unrounded summary values were used in the conversion-efficiency calculation. Teacher capacity, student engagement, structural conditions, and student–teacher differences were examined at the item level using verified frequencies and percentages. No overall composite scores were calculated for these dimensions. For indicators shared by the student and teacher

questionnaires, descriptive differences were calculated by subtracting the student-reported percentage from the teacher-reported percentage. No individual-level responses were estimated or reconstructed. Consequently, analyses requiring linked participant-level observations, including correlation, regression, factor analysis, matched student–teacher comparisons, and separate reliability testing of the descriptive indicators, could not be conducted. The findings are therefore interpreted as descriptive patterns observed within the four participating schools and should not be considered statistically generalizable differences between all public and private schools.

Ethical Considerations

This study was conducted as part of an approved master’s thesis. The questionnaires collected information about instructional materials and classroom practices and did not request participants’ names or other direct personal identifiers. The results were retained and reported only in aggregated form, and the revised article does not identify the participating students, teachers, or schools. The present study involved secondary analysis of the summarized results preserved in the approved thesis and did not require renewed contact with the original participants. The thesis does not report a formal institutional ethics committee approval number or provide detailed documentation of parental consent and student assent procedures. Therefore, the present article does not retrospectively claim an ethics approval or consent procedure that cannot be verified from the surviving research records. All analyses and reporting were conducted with attention to participant anonymity, confidentiality, and accurate representation of the archived results.

RESULTS

Access–Use Gap in Mathematics Instructional Materials

The first analysis examined the relationship between students’ reported access to mathematics instructional materials and their reported classroom use. The access summary was derived from mathematics kit availability, material sufficiency, and material appropriateness, whereas the use summary was based on reported use of mathematics kits, charts or visual forms, and simple locally available materials. The raw frequencies and percentages for all six indicators are presented in Table 1.

Students in the selected public schools reported higher levels of access than those in the selected private schools. The access summary was 73.3% in public schools and 49.4% in private schools. A similar descriptive pattern was observed

for classroom use, with use summaries of 63.6% and 42.5%, respectively. The item-level results indicate that public-school students generally reported higher availability, sufficiency, appropriateness, and classroom use of instructional materials than private-school students (Table 1; Figure 2).

The access summary exceeded the use summary by 9.7 percentage points in the selected public schools and by 6.9 percentage points in the selected private schools. Despite the difference in overall access levels, conversion efficiency was descriptively similar across the two school types: 86.8% in public schools and 86.0% in private schools. Thus, the more notable numerical difference concerned the initial level of reported access rather than the proportion of access reflected in classroom use. These findings are descriptive and do not represent inferential comparisons between the two school types.

Table 1
Student-Reported Access to and Use of Mathematics Instructional Materials by School Type

Indicator	Public schools, n/N (%)	Private schools, n/N (%)
Access indicators		
Mathematics kit available	128/182 (70.3)	16/29 (55.2)
High/very high material sufficiency	132/182 (72.5)	10/29 (34.5)
High/very high material appropriateness	140/182 (76.9)	17/29 (58.6)
Access summary (%)	73.3	49.4
Use indicators		
High/very high use of mathematics kits	103/182 (56.6)	10/29 (34.5)
High/very high use of charts or visual forms	124/182 (68.1)	14/29 (48.3)
High/very high use of simple local materials	120/182 (65.9)	13/29 (44.8)
Use summary (%)	63.6	42.5
Access–use gap (percentage points)	9.7	6.9
Conversion efficiency (%)	86.8	86.0

Note. For mathematics kit availability, the reported frequency represents students who selected “yes.” For the other indicators, the reported frequency combines “very high” and “high” responses. The access and use summaries are unweighted averages of their three component percentages. Conversion efficiency was calculated as use summary ÷ access summary × 100. All results are descriptive and refer only to the participating schools. Conversion efficiency was calculated using the unrounded access and use summary values.

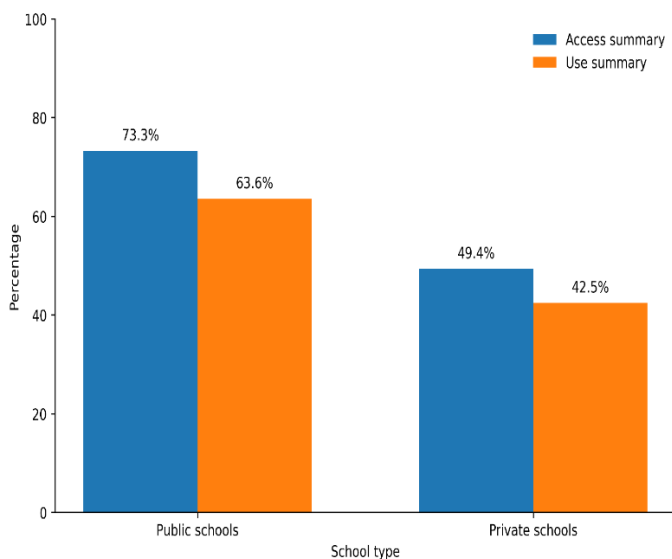


Figure 2
Student-Reported Access and Use Summaries by School Type

The access and use summaries are unweighted averages of the relevant aggregated item percentages. Values are descriptive and refer only to the participating schools

Teacher Capacity, Student Engagement, and Training Constraints

The second part of the analysis examined item-level indicators of teacher capacity, student engagement, practical classroom activities, and access to in-service training. Because the original individual-level dataset was unavailable, the findings are reported using the verified frequencies and percentages preserved in the thesis rather than composite scale scores.

Teachers in the selected public schools generally reported higher familiarity, skill, and mastery in using mathematics instructional materials than teachers in the selected private schools. However, students' assessments did not fully reflect this difference. In particular, students reported similar levels of teacher familiarity and skill across the two school types, although reported teacher mastery remained somewhat higher in the public schools (Table 2).

Student participation and the frequency of practical mathematics activities also showed descriptive differences between the participating school groups. Public-school students reported higher participation in the use of instructional materials, while teachers' reports indicated a smaller difference between school types. Practical activities conducted at least four times per week were also reported more frequently by public-school teachers.

Access to in-service training was limited in both groups, particularly in the selected private schools. In addition, only 6 of the 28 teachers in the full sample (21.4%) held a degree in mathematics. These findings identify subject preparation and professional development as relevant contextual concerns within the participating schools. However, because the results are descriptive and cross-sectional, they do not establish that teacher capacity or training caused the observed patterns of instructional-material use.

Table 2
Teacher Capacity, Student Engagement, and Training Indicators by School Type

Indicator	Public schools, n/N (%)	Private schools, n/N (%)	Respondent source
High/very high teacher familiarity and skill	18/21 (85.7)	3/7 (42.9)	Teachers
High/very high teacher mastery	20/21 (95.2)	5/7 (71.4)	Teachers
High/very high teacher familiarity and skill	156/182 (85.7)	26/29 (89.7)	Students
High/very high teacher mastery	150/182 (82.4)	21/29 (72.4)	Students
High/very high student participation	146/182 (80.2)	17/29 (58.6)	Students
High/very high student participation	16/21 (76.2)	5/7 (71.4)	Teachers
Practical activities conducted at least four times per week	15/21 (71.4)	3/7 (42.9)	Teachers
No or limited in-service training	14/21 (66.7)	6/7 (85.7)	Teachers

Note. High/very high values combine the two highest response categories. Practical activities conducted at least four times per week combine the categories of four to six times and more than six times per week. No or limited in-service training includes teachers who reported no relevant training or only one to five training experiences. In the full teacher sample, 6 of 28 teachers (21.4%) held a degree in mathematics. All results are descriptive and refer only to the participating schools.

Structural Conditions and Constraints Affecting Material Use

The third part of the analysis examined teacher-reported structural conditions that could limit the use of mathematics instructional materials. These included material insufficiency or inappropriateness, weak alignment with textbook content,

limited instructional time, crowded classrooms, and heavy textbook load. For positively worded items, moderate, low, and very low responses were classified as less-than-adequate conditions, whereas high and very high responses indicated constraints for directly worded barrier items.

Teachers in both school groups reported several structural constraints, particularly regarding material sufficiency, material appropriateness, and crowded classrooms. Across all six indicators presented in Table 3, the percentages were descriptively higher among teachers in the selected private schools.

The largest difference concerned alignment between instructional materials and mathematics textbook content. Less-than-adequate alignment was reported by 2 of 21 public-school teachers (9.5%), compared with 6 of 7 private-school teachers (85.7%). Constraints related to instructional time and heavy textbook load were also more frequently reported in the selected private schools. However, these differences should be interpreted cautiously because the private-school group included only seven teachers.

Overall, the findings indicate that structural conditions may have limited the effective use of instructional materials in both participating school groups. Limited access to professional development, reported separately in Table 3, provides additional context for these constraints. All comparisons are descriptive and are not intended to support causal or generalizable conclusions.

Table 3
Teacher-Reported Structural Conditions and Constraints Affecting the Use of Mathematics Instructional Materials

Structural condition or constraint	Public schools, n/N (%)	Private schools, n/N (%)
Material sufficiency not rated high/very high	13/21 (61.9)	5/7 (71.4)
Material appropriateness not rated high/very high	15/21 (71.4)	6/7 (85.7)
Textbook alignment not rated high/very high	2/21 (9.5)	6/7 (85.7)
Adequacy of instructional time not rated high/very high	8/21 (38.1)	4/7 (57.1)
Crowded classrooms rated high/very high	13/21 (61.9)	5/7 (71.4)
Heavy textbook load rated high/very high	8/21 (38.1)	5/7 (71.4)

Note. For positively worded items concerning material sufficiency, material appropriateness, textbook alignment, and adequate instructional time, the reported frequencies combine moderate, low, and very low responses. For directly worded constraint items concerning crowded classrooms and heavy textbook load, the

reported frequencies combine high and very high responses. Percentages are based on 21 public-school teachers and 7 private-school teachers. The findings are descriptive and refer only to the participating schools.

Student–Teacher Differences in Reported Availability and Use

The fourth part of the analysis compared student and teacher reports across seven shared indicators concerning the availability and use of mathematics instructional materials, teacher capacity, and student participation. Because students and teachers were separate respondent groups, the comparisons were descriptive and did not represent matched individual-level agreement.

In the selected public schools, student and teacher reports varied by indicator. Students reported greater mathematics kit availability than teachers, whereas teachers generally reported higher levels of classroom use of mathematics kits, charts or visual forms, and simple locally available materials. Reports of teacher familiarity and skill were identical, while the differences in teacher mastery and student participation were relatively modest (Table 4).

The pattern in the selected private schools was also mixed. Teachers reported substantially greater kit availability than students, with a difference of 30.5 percentage points. The largest difference, however, concerned teacher familiarity and skill: 89.7% of students rated this indicator as high or very high, compared with 42.9% of teachers. By contrast, reports of classroom use and teacher mastery were relatively similar across the two respondent groups.

Overall, student and teacher perspectives were aligned for some indicators but differed considerably for others. The direction and magnitude of the differences depended on the specific aspect of instructional-material availability or classroom practice. These comparisons should be interpreted cautiously because the teacher samples were small, particularly in the selected private schools.

Table 4
Student–Teacher Differences in Reports of Mathematics Instructional Materials

School type	Indicator	Students, n/N (%)	Teachers, n/N (%)	Teacher–student difference
Public	Mathematics kit available	128/182 (70.3)	10/21 (47.6)	–22.7
Public	High/very high use of mathematics kits	103/182 (56.6)	15/21 (71.4)	+14.8
Public	High/very high use of charts or visual forms	124/182 (68.1)	17/21 (81.0)	+12.9
Public	High/very high use of simple local materials	120/182 (65.9)	17/21 (81.0)	+15.1

Public	High/very high teacher familiarity and skill	156/182 (85.7)	18/21 (85.7)	0.0
Public	High/very high teacher mastery	150/182 (82.4)	20/21 (95.2)	+12.8
Public	High/very high student participation	146/182 (80.2)	16/21 (76.2)	-4.0
Private	Mathematics kit available	16/29 (55.2)	6/7 (85.7)	+30.5
Private	High/very high use of mathematics kits	10/29 (34.5)	2/7 (28.6)	-5.9
Private	High/very high use of charts or visual forms	14/29 (48.3)	3/7 (42.9)	-5.4
Private	High/very high use of simple local materials	13/29 (44.8)	3/7 (42.9)	-1.9
Private	High/very high teacher familiarity and skill	26/29 (89.7)	3/7 (42.9)	-46.8
Private	High/very high teacher mastery	21/29 (72.4)	5/7 (71.4)	-1.0
Private	High/very high student participation	17/29 (58.6)	5/7 (71.4)	+12.8

Note. The teacher–student difference was calculated by subtracting the student-reported percentage from the teacher-reported percentage. Positive values indicate a higher percentage among teachers, whereas negative values indicate a higher percentage among students. High/very high values combine the two highest response categories. Students and teachers were separate respondent groups; therefore, the differences are descriptive and do not represent matched individual-level comparisons or a formal test of agreement.

Integrated Descriptive Synthesis

Taken together, Tables 1–4 and Figure 2 show that students in the selected public schools reported higher levels of access to and classroom use of mathematics instructional materials than students in the selected private schools. However, conversion efficiency was nearly identical across the two school types, indicating that the principal difference concerned the initial level of access rather than the proportion of available materials reflected in classroom use.

Teacher-capacity and student-engagement patterns varied according to the indicator and respondent source. Student and teacher reports were similar for some measures but differed substantially for others, particularly mathematics kit availability and teacher familiarity and skill in the selected private schools. Structural constraints were reported in both groups, with the largest difference concerning alignment between instructional materials and textbook content. Limited access to in-service training was also common.

Overall, the findings suggest that reported access and classroom use were shaped by several interrelated conditions, including material suitability, textbook alignment, professional development, classroom conditions, and student participation. Because the analysis was based on aggregated descriptive data from four selected schools, the results should be interpreted as context-specific patterns rather than statistically tested or generalizable differences.

DISCUSSION & CONCLUSIONS

Interpreting the Access–Use Gap

The findings highlight an important distinction between access to mathematics instructional materials and their actual use in classroom instruction. Students in the selected public schools reported higher access and use summaries than those in the selected private schools. Nevertheless, access exceeded reported use in both groups, indicating that the availability of materials alone does not ensure their regular integration into teaching. Instructional materials acquire educational value through the ways teachers select, adapt, and incorporate them into classroom activities (Oakes & Saunders, 2002, 2004; Remillard, 2005; Yan & He, 2012).

Although access and use were higher in the participating public schools, conversion efficiency was nearly identical across the two school types: 86.8% in public schools and 86.0% in private schools. Because this indicator was calculated from aggregated descriptive summaries, it should not be interpreted as a validated measure of teacher effectiveness or as evidence of equal instructional quality. Rather, the close values suggest that the principal numerical difference concerned the initial level of access rather than the proportion of available materials reflected in classroom use.

This distinction has practical implications. Lower classroom use should not automatically be attributed to teachers' unwillingness or limited capacity when the available resource base is also weaker. In the selected private schools, improving classroom use may therefore require attention to material availability, sufficiency, and appropriateness, alongside support for implementation. In the selected public schools, the remaining access–use gap similarly indicates a need to ensure that available materials are relevant, visible, and routinely incorporated into mathematics lessons.

These findings are consistent with research showing that educational resources contribute to classroom practice only when provision is accompanied by meaningful implementation and supportive instructional conditions (Glewwe et al., 2011; Travé González & Pozuelos Estrada, 2017). However, because the analysis was based on aggregated data from four selected schools, the observed patterns should be interpreted as context-specific rather than as evidence that one

school sector generally converts resources into classroom practice more effectively than the other.

Teacher Capacity, Student Engagement, and Training Needs

The findings in Table 2 show that perceptions of teacher capacity varied according to both school type and respondent source. Recent evidence from resource-constrained mathematics classrooms also indicates that teacher knowledge and motivation can play an important role in shaping student engagement (Dadzie et al., 2025). Teachers in the selected public schools rated their own familiarity, skill, and mastery in using mathematics instructional materials more positively than teachers in the selected private schools. High or very high familiarity and skill were reported by 85.7% of public-school teachers, compared with 42.9% of private-school teachers, while the corresponding mastery figures were 95.2% and 71.4%. These differences suggest that teachers in the participating public schools generally expressed greater confidence in their ability to work with instructional materials.

Students' reports, however, present a more nuanced picture. Public- and private-school students rated teacher familiarity and skill at similarly high levels, at 85.7% and 89.7%, respectively. Student ratings of teacher mastery were also closer than the teachers' self-reports, although the percentage remained somewhat higher in the selected public schools. The contrast between teacher and student reports is particularly noticeable in the private-school group, where students evaluated teacher familiarity and skill much more positively than teachers evaluated themselves. This difference may reflect variation in self-assessment, professional expectations, or the aspects of classroom performance that students and teachers considered when answering the questionnaire. Because the two groups were not matched at the individual level, the data do not allow a more definite explanation. The student-engagement findings also differed by respondent source. Students in the selected public schools reported substantially higher participation in material-based classroom activities than students in the selected private schools, at 80.2% and 58.6%, respectively. Teachers' reports showed a narrower difference, with 76.2% of public-school teachers and 71.4% of private-school teachers reporting high or very high student participation. This variation suggests that teacher reports of participation may not always correspond fully with students' own experience of being actively involved. Participation should therefore be understood as more than observing a teacher's demonstration; it includes opportunities for students to handle materials, explore mathematical relationships, discuss their observations, and take part in practical problem-solving.

The frequency of practical classroom activities provides further context for the engagement findings. As shown in Table 2, 71.4% of public-school teachers reported conducting practical mathematics activities at least four times per week,

compared with 42.9% of private-school teachers. Although this difference is descriptive, it is consistent with the higher level of student participation reported in the selected public schools. Previous research likewise suggests that teachers' knowledge of instructional materials becomes educationally meaningful when it is translated into classroom interaction and opportunities for students to engage directly with mathematical ideas (Ball & Cohen, 1996; Hill & Chin, 2018; Remillard, 2005).

Professional preparation remained a concern in both school groups. No relevant in-service training or only limited training was reported by 66.7% of public-school teachers and 85.7% of private-school teachers, while only 6 of the 28 teachers in the full sample (21.4%) held a degree in mathematics. These figures do not establish a causal relationship between professional preparation and classroom practice, but they indicate that many participating teachers had limited access to sustained mathematics-specific development.

Professional development should therefore move beyond general discussions of instructional materials and provide practical, curriculum-linked guidance on selecting, adapting, and using materials for specific mathematics topics. Hands-on and sustained professional learning may strengthen teachers' capacity to adapt materials to classroom needs, particularly when supported by adequate infrastructure and follow-up assistance (Stigberg & Stigberg, 2026). Training should also help teachers move from demonstration toward active student participation in crowded or resource-constrained classrooms (Enayat & Anwari, 2026). This interpretation is consistent with research emphasizing sustained attention to subject knowledge, pedagogical reasoning, and classroom application rather than isolated or purely theoretical training sessions (Jacob et al., 2017; Koellner et al., 2011; Enayat & Anwari, 2026).

Structural Conditions, Constraints, and Curriculum Alignment

The findings presented in Table 3 indicate that the classroom use of mathematics instructional materials cannot be explained solely by teachers' willingness or competence. Teachers in both school groups reported structural conditions that could make regular material-based instruction difficult, although the percentages were descriptively higher in the selected private schools. These conditions included material sufficiency and suitability, textbook alignment, instructional time, crowded classrooms, and heavy curriculum demands.

Material sufficiency and appropriateness were concerns in both groups. However, the most pronounced difference concerned alignment between instructional materials and mathematics textbook content. Less-than-high alignment was reported by 9.5% of public-school teachers and 85.7% of private-school teachers. This difference should be interpreted cautiously because only seven private-school teachers participated. Nevertheless, it highlights the practical

difficulty of using materials that do not correspond closely with prescribed topics, lesson sequences, or textbook activities. Teachers do not use curriculum materials mechanically; their decisions are shaped by curricular goals, subject content, and classroom demands (Remillard, 2005; Travé González & Pozuelos Estrada, 2017).

Crowded classrooms, limited instructional time, and heavy textbook load may further restrict teachers' ability to organize practical activities and involve students directly. These conditions are likely to overlap rather than operate independently. Materials may be available but remain underused when teachers lack sufficient time, teach large classes, face pressure to complete the textbook, or must substantially adapt resources before using them.

Previous research similarly indicates that educational resources become instructionally useful when they are supported by appropriate training, organizational conditions, and alignment with classroom expectations (Costan et al., 2021; Yan & He, 2012). Efforts to strengthen material use should therefore extend beyond supplying additional resources and consider curriculum alignment, lesson time, and the practical demands of large classes. Because the findings are descriptive and based on four selected schools, they do not establish that these conditions caused lower material use, but they identify areas requiring attention from school leaders and curriculum planners.

Student–Teacher Differences in Reported Availability and Use

The comparisons in Table 4 show that student and teacher reports did not differ in a consistent direction. This suggests that the two respondent groups may assess instructional-material conditions from different perspectives. Teachers may interpret availability in terms of whether resources exist within the school, whereas students may respond according to what they observe during mathematics lessons.

This distinction was particularly evident for mathematics kit availability. In the selected public schools, students reported greater availability than teachers, while the opposite pattern appeared in the selected private schools. The private-school difference may indicate that materials were present but not consistently visible to students, or that respondents understood “availability” differently. The data do not allow these explanations to be confirmed.

Reported classroom use followed another pattern. Public-school teachers reported more frequent use of mathematics kits, visual materials, and simple local resources than students, whereas student and teacher responses were relatively close in the selected private schools. These findings reinforce the distinction between having materials within a school and using them regularly enough for students to recognize them as part of classroom instruction (Oakes & Saunders, 2002, 2004; Remillard, 2005).

The largest difference concerned teacher familiarity and skill in the selected private schools, where 89.7% of students provided high or very high ratings,

compared with 42.9% of teachers. Teachers may have evaluated themselves against more demanding professional standards, while students may have relied mainly on visible classroom performance. Because the questionnaires did not examine the reasons for these judgments, student perceptions and teacher self-assessments should not be treated as equivalent measures.

Differences in reported student participation were smaller but also varied by respondent group, possibly reflecting different understandings of what constitutes active participation (Dadzie et al., 2025). Overall, the findings demonstrate the value of considering both student and teacher perspectives. However, because the respondent groups were not matched at the classroom or individual level, the differences in Table 4 do not constitute a formal test of agreement or indicate that either group provided more accurate information. Classroom observations, interviews, and school resource records would be useful for explaining the areas in which perceptions diverged.

Practical Implications

The findings have practical implications for schools, educational district authorities, curriculum planners, and teacher-development providers. As shown in Table 1 and Figure 2, students in both school groups reported lower classroom use than access, although both were higher in the selected public schools. Increasing the number of materials alone may therefore be insufficient. Schools should conduct inventories to determine which materials are available, usable, curriculum-relevant, and routinely accessible. This is particularly important in the selected private schools, where students reported lower access and use.

The results in Table 3 also highlight curriculum alignment. Six of the seven private-school teachers did not rate alignment between instructional materials and textbook content as high or very high. Although this finding should be interpreted cautiously, it suggests that mathematics kits, charts, manipulatives, and locally produced materials should be linked to specific textbook topics, grade levels, and learning objectives. Teachers are more likely to use materials when their relevance to prescribed lessons is clear (Remillard, 2005; Travé González & Pozuelos Estrada, 2017).

Teacher professional development is another priority. As reported in Table 2, limited or no relevant in-service training was reported by 66.7% of public-school teachers and 85.7% of private-school teachers, while only 21.4% of the full teacher sample held a mathematics degree. Professional development should therefore be sustained, mathematics-specific, and closely connected to classroom practice. It should demonstrate how to use and adapt materials for topics such as number operations, measurement, geometry, patterns, and problem-solving. Demonstrations followed by lesson planning, peer observation, and school-based follow-up may be more useful than one-time theoretical seminars (Golegou et al.,

2026). Such support could strengthen connections between subject knowledge, pedagogical reasoning, and classroom application (Ball & Cohen, 1996; Jacob et al., 2017; Koellner et al., 2011).

Student participation should also be treated as a central indicator of effective material use. Table 2 shows differences in student-reported participation, while Table 4 demonstrates that teacher and student reports were not always identical. Simply displaying a chart or demonstrating a mathematics kit should not automatically be considered active engagement. Students should have opportunities to handle materials, measure objects, construct shapes, compare quantities, discuss patterns, and explain mathematical relationships. As Table 3 indicates, these activities must also account for crowded classrooms, heavy textbook loads, and limited instructional time. Small-group work, rotating activities, shared resources, and inexpensive local materials may offer practical alternatives.

Finally, the differences reported in Table 4 suggest that schools should monitor both resource availability and students' actual classroom experiences. Reviews combining teacher reports, student feedback, classroom observation, and resource records could show whether materials are merely stored or regularly used. Because the study involved only four selected schools, these recommendations are not presented as a universal model. Rather, they identify adaptable priorities involving resource auditing, textbook alignment, mathematics-specific training, active participation, and classroom-level monitoring.

Limitations and Future Research

Several limitations should be considered when interpreting the findings. First, the study involved four selected primary schools—two public and two private—within one educational district of Kabul City. The sample was uneven across school types, particularly among teachers, with 21 public-school teachers and only 7 private-school teachers. Percentages in the private-school group were therefore sensitive to individual responses. The findings should be interpreted as patterns within the participating schools rather than representative estimates for Kabul or Afghanistan. Future research should include larger and more diverse samples across districts, provinces, urban and rural settings, and different types of public and private schools.

Second, the study relied on student and teacher questionnaires. Responses may have been influenced by memory, personal expectations, social desirability, or different interpretations of terms such as availability, participation, familiarity, and mastery. The differences reported in Table 4 show that students and teachers did not always describe the same conditions similarly. Because their responses were not matched at the classroom or individual level, formal agreement could not

be assessed. Future studies should combine questionnaires with classroom observations, interviews, school resource inventories, and document review.

Third, the cross-sectional design captured conditions at one point in time and cannot establish whether resource access, teacher training, curriculum alignment, or classroom conditions caused differences in material use or student participation. Longitudinal and intervention studies could examine whether targeted material provision, curriculum-linked professional development, or improved textbook alignment leads to measurable changes in classroom practice.

Fourth, the original individual-level Excel/SPSS dataset had been lost and could not be recovered during revision. Verified item-level frequencies and percentages preserved in the approved thesis were used to reconstruct the aggregated descriptive analyses, and no individual responses were estimated or recreated. However, the absence of participant-level data prevented correlation, regression, factor analysis, matched student–teacher comparisons, and inferential comparisons of individual-level scale scores.

The missing dataset also prevented separate reliability testing of the descriptive indicators. Although the original thesis reported an overall Cronbach’s alpha of .83, separate coefficients were unavailable for the student and teacher questionnaires and for the access, use, teacher-capacity, student-engagement, and structural-condition indicators. These indicators should therefore be treated as retrospective descriptive summaries rather than independently validated psychometric scales. Conversion efficiency should likewise be interpreted as a descriptive ratio rather than a standardized measure of teacher performance or instructional quality.

Future research should retain anonymized participant-level datasets in secure institutional repositories and document the construction, scoring, validity, and reliability of each measure. Larger multilevel and mixed-method studies could distinguish student-, teacher-, classroom-, and school-level influences and explain why available materials are not always used, how teachers adapt resources to textbook content, and which forms of professional support are most practical in crowded and resource-constrained classrooms.

Conclusion

This study examined the gap between access to mathematics instructional materials and their classroom use in four selected public and private primary schools in Kabul City. Students in the participating public schools reported higher access and use than those in the private schools. However, conversion efficiency was nearly identical in both groups—86.8% in public schools and 86.0% in private schools—suggesting that the main difference lay in the initial level of access rather than in the proportion of available materials used in teaching. The findings also showed that material use was influenced by textbook alignment, teacher training,

classroom conditions, and opportunities for student participation. Differences between student and teacher reports further indicated that the availability of materials at the school level does not always mean that students regularly see or use them in class. Improving mathematics instruction therefore requires more than supplying materials; resources must be curriculum-aligned, supported by practical teacher development, and integrated into active classroom learning. Because the study was based on aggregated, self-reported data from four selected schools, the findings should be interpreted as context-specific rather than generalized to all schools in Kabul or Afghanistan.

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Conflict of Interest

The authors declare no conflict of interest.

DECLARATION OF AI-ASSISTED TECHNOLOGIES

During the preparation of this manuscript, the authors used ChatGPT (GPT-5.6 Thinking, OpenAI) solely to improve English-language clarity, grammar, readability, and organization. The AI tool was not used to generate research data, perform statistical analyses, interpret the findings, or formulate scientific conclusions. All AI-assisted text was critically reviewed, verified, and revised by the authors, who take full responsibility for the accuracy, originality, integrity, and final content of the manuscript.

REFERENCES

- Ball, D. L., & Cohen, D. K. (1996). Reform by the book: What is—or might be—the role of curriculum materials in teacher learning and instructional reform? *Educational Researcher*, 25(9), 6–14.
<https://doi.org/10.3102/0013189X025009006>
- Baum, D. R., Abdul-Hamid, H., & Wesley, H. T. (2018). Inequality of educational opportunity: The relationship between access, affordability, and quality of private schools in Lagos, Nigeria. *Oxford Review of Education*, 44(4), 459–475. <https://doi.org/10.1080/03054985.2017.1421153>

- Boadu, S. K., Boateng, F. O., & Obeng, B. A. (2026). Factors influencing students' interest in mathematics: A systematic literature review. *American Journal of STEM Education*, 25, 41–65. <https://doi.org/10.32674/cwdfam22>
- Costan, E., Gonzales, G., Gonzales, R., Enriquez, L., & Pena, C. (2021). Education 4.0 in developing economies: A systematic literature review of implementation barriers and future research agenda. *Sustainability*, 13(22), Article 12763. <https://doi.org/10.3390/su132212763>
- Dadzie, J., Anaan-Brew, R. K., & Danso, E. (2025). Gamification in Ghanaian mathematics classrooms: Examining the roles of teacher knowledge, motivation, and self-efficacy on student engagement. *American Journal of STEM Education*, 15, 45–86. <https://doi.org/10.32674/6b6sns36>
- Enayat, W., & Anwari, S. (2026). Students' perceptions of collaborative learning in primary mathematics classrooms in Afghanistan: An exploratory case study. *SN Social Sciences*, 6, Article 265. <https://doi.org/10.1007/s43545-026-01563-w>
- Enayat, W., Noorzia, A., Rahimi, N., & Qarloq, R. (2025). Improving math learning and motivation in disadvantaged schools: A case study of Chahi-Zandan Girls' High School. *Samangan Academic & Research Journal*, 3(2), 1–21. <https://researchsparker.edu.af/index.php/SARJ/article/view/137>
- Flores, A. (2007). Examining disparities in mathematics education: Achievement gap or opportunity gap? *The High School Journal*, 91(1), 29–42. <https://doi.org/10.1353/hsj.2007.0022>
- Frehywot, S., Vovides, Y., Talib, Z., Mikhail, N., Ross, H., Wohltjen, H., Bedada, S., Korhumel, K., Koumare, A. K., & Scott, J. (2013). E-learning in medical education in resource-constrained low- and middle-income countries. *Human Resources for Health*, 11, Article 4. <https://doi.org/10.1186/1478-4491-11-4>
- Glewwe, P. W., Hanushek, E. A., Humpage, S. D., & Ravina, R. (2011). *School resources and educational outcomes in developing countries: A review of the literature from 1990 to 2010* (NBER Working Paper No. 17554). National Bureau of Economic Research. <https://doi.org/10.3386/w17554>
- Golegou, E., Wallace, M., & Peppas, K. (2026). Student-centered pedagogies for 21st-century STEM: A comparative review and implementation guide. *American Journal of STEM Education*, 18, 83–124. <https://doi.org/10.32674/qnh67005>
- Grujters, R. J., Alcott, B., & Rose, P. (2021). Do private schools improve learning outcomes? Evidence from within-household comparisons in East Africa and South Asia. *Comparative Education Review*, 65(4), 640–666. <https://doi.org/10.1086/716448>
- Hill, H. C., & Chin, M. (2018). Connections between teachers' knowledge of students, instruction, and achievement outcomes. *American Educational*

- Research Journal*, 55(5), 1076–1112.
<https://doi.org/10.3102/0002831218769614>
- Jacob, R., Hill, H., & Corey, D. (2017). The impact of a professional development program on teachers' mathematical knowledge for teaching, instruction, and student achievement. *Journal of Research on Educational Effectiveness*, 10(2), 379–407.
<https://doi.org/10.1080/19345747.2016.1273411>
- Koellner, K., Jacobs, J., & Borko, H. (2011). Mathematics professional development: Critical features for developing leadership skills and building teachers' capacity. *Mathematics Teacher Education and Development*, 13(1), 115–128.
- Kul, Ü., Çelik, S., & Aksu, Z. (2018). The impact of educational material use on mathematics achievement: A meta-analysis. *International Journal of Instruction*, 11(4), 303–324. <https://doi.org/10.12973/iji.2018.11420a>
- León, G., & Valdivia, M. (2015). Inequality in school resources and academic achievement: Evidence from Peru. *International Journal of Educational Development*, 43, 85–95. <https://doi.org/10.1016/j.ijedudev.2014.11.001>
- Oakes, J., & Saunders, M. (2002). *Access to textbooks, instructional materials, equipment, and technology: Inadequacy and inequality in California's public schools*. UCLA Institute for Democracy, Education, and Access.
- Oakes, J., & Saunders, M. (2004). Education's most basic tools: Access to textbooks and instructional materials in California's public schools. *Teachers College Record*, 106(10), 1967–1988.
<https://doi.org/10.1111/j.1467-9620.2004.00423.x>
- Putra, Z. H., Alim, J. A., Kurnia, R., Gunawan, Y., Dahnilsyah, D., & Aljarrah, A. (2026). A systematic literature review of joyful learning in mathematics: An implication for teaching and learning in elementary school. *Frontiers in Education*, 11, Article 1561649.
<https://doi.org/10.3389/feduc.2026.1561649>
- Remillard, J. T. (2005). Examining key concepts in research on teachers' use of mathematics curricula. *Review of Educational Research*, 75(2), 211–246.
<https://doi.org/10.3102/00346543075002211>
- Romuald, N. K. (2023). An analysis of inequalities in school performance between public and private students in sub-Saharan Africa. *International Journal of Educational Development*, 102, Article 102833.
<https://doi.org/10.1016/j.ijedudev.2023.102833>
- Schroeder, C. M., Scott, T. P., Tolson, H., Huang, T. Y., & Lee, Y. H. (2007). A meta-analysis of national research: Effects of teaching strategies on student achievement in science in the United States. *Journal of Research in Science Teaching*, 44(10), 1436–1460. <https://doi.org/10.1002/tea.20212>
- Stigberg, H., & Stigberg, S. (2026). Unpacking teachers' transformative agency following digital fabrication workshops on making mathematical

- manipulatives. *Digital Experiences in Mathematics Education*, 12, 393–415. <https://doi.org/10.1007/s40751-026-00194-3>
- Travé González, G., & Pozuelos Estrada, F. J. (2017). How teachers design and implement instructional materials to improve classroom practice. *Intangible Capital*, 13(5), 967–1043. <https://doi.org/10.3926/ic.1062>
- Tripó, J., & Debreñti, E. (2026). Mathematical development through non-digital instruction: A meta-analysis of primary and middle school education. *Frontiers in Education*, 11, Article 1729068. <https://doi.org/10.3389/educ.2026.1729068>
- Yan, C., & He, C. (2012). Bridging the implementation gap: An ethnographic study of English teachers' implementation of the curriculum reform in China. *Ethnography and Education*, 7(1), 1–17. <https://doi.org/10.1080/17457823.2012.661585>
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