Influence of Tablet-Based Learning Activities on Pupils' Engagement and Participation in Primary Schools: A Systematic Review

Godlove Elineema
Tanzania Institute of Education, Dar es Salaam, Tanzania
Email: godlove.elineema@tie.go.tz

Abstract.

Governments in sub-Saharan Africa are placing tablets in primary schools at growing scale, yet the question of what particular tablet activities do for pupils' engagement and participation has received less attention than questions about test scores. Tanzania offers a clear case: large public investment in devices has run ahead of evidence on how pupils respond to them in class. The review examined three relationships: (a) the effect of multimedia content (pictures, video and audio) on pupils' understanding of concepts; (b) the effect of educational games, counting activities and songs on pupils' interest and classroom participation; and (c) the effect of enlarged materials and audio resources on the participation of pupils with seeing and hearing difficulties. The review followed PRISMA 2020. Searches of web-indexed scholarly and grey literature, supplemented by citation tracking, identified 239 records. After screening against pre-set criteria, 19 studies were included: 14 primary studies and five systematic reviews or meta-analyses. Study quality was appraised with the Mixed Methods Appraisal Tool, and findings were combined through a structured narrative synthesis. Evidence for the first objective was the strongest. Randomised trials in Malawi and England, and a two-year trial in Malawi, reported learning gains from interactive, multimedia-rich apps, and pooled estimates from reviews were small to moderate. Evidence for the second objective was consistent in direction but relied more on observation and teacher report; game-like activities raised interest and attendance, and equalised participation between girls and boys. Evidence for the third objective was thin and indirect; no included study tested enlarged text or audio features alone for pupils with visual or hearing impairment. Tablet activities are most likely to raise engagement when content is interactive, in a familiar language, and built into structured routines. Claims about inclusive participation run ahead of the evidence, and Tanzanian research designed to test that relationship is needed.

Journal of Policy and Development Studies (JPDS)
Vol. 20 Issue 6 (2026)
ISSN(p) 1597-9385
ISSN (e) 2813-1091
Home page:
https://www.ajol.info/index.php/jpds

ARTICLE INFO:

Keyword
Tablet-based learning; pupil engagement; classroom participation; multimedia learning; educational games; inclusive education; Tanzania

Received: 10 August 2026
Revised: 2 October 2026
Accepted: 7 October 2026

DOI
https://dx.doi.org/10.4314/jpds.v20i6.13

1. Introduction

Over the past decade, the tablet has moved from the margins of education policy in East Africa to its centre. In Tanzania, the government distributed about 293,400 tablets to primary and secondary school teachers in the 2022 financial year (Prosper & Nderego, 2024), and a separate public programme, MsingiTek, now places shared, solar-charged learning tablets in primary schools in several regions. Headteachers in Shinyanga have linked this programme to lower absenteeism and higher enrolment, to the point that some schools now run pupils through the devices in shifts (The Citizen, 2026). Similar programmes operate in Malawi, where the government is taking a tablet programme to every public primary school (Global Partnership for Education, 2025), and in Kenya through the Digital Literacy Programme (Murithi & Yoo, 2021).

These investments rest on an assumption that tablets make learning more engaging and that engagement, in turn, supports achievement. The assumption is plausible. Engagement is a well-established predictor of school success, and it has behavioural, emotional and cognitive sides: pupils take part, they feel interest, and they invest mental effort in understanding (Fredricks et al., 2004). Yet the tablet is not a single intervention. The same device can show a short video, run a counting game, play a song or enlarge a page of text, and each of these activities acts on engagement in a different way. Research reviews have tended to ask whether tablets raise test scores in general (Haßler et al., 2016; Tamim et al., 2015) rather than which activities change what pupils do and feel in class.

The policy basis for this expansion is long-standing. The ICT Policy for Basic Education (Ministry of Education and Vocational Training, 2007) first set out the aim of using technology to improve teaching and learning in schools, and the Education and Training Policy 2014, 2023 edition, places digital skills and learner-centred, competence-based teaching at the heart of the reformed curriculum (Ministry of Education, Science and Technology [MoEST], 2023). A draft National Digital Education Strategy for 2024 to 2030 goes further, describing interactive digital content, e-learning platforms and ICT resource centres as tools for primary education (MoEST, 2024). The direction of policy is therefore clear. What is less clear is what pupils experience when the devices reach the classroom.

The gap between policy and evidence matters for Tanzania. Classes in public primary schools are large, and national data have shown very low ratios of ICT equipment to pupils (The Citizen, 2022). When a school has a small number of devices, choices about which activities to run are choices about how to spend scarce minutes of pupil contact. Evidence on which activities engage pupils, and for whom, is therefore of direct practical value. The question is also one of equity. The Education and Training Policy (MoEST, 2023) commits the country to inclusive education, and tablets are often promoted as a way to reach pupils with seeing and hearing difficulties. Whether that promise holds is an empirical question.

This systematic review therefore asks one main question: what is the influence of tablet-based learning activities on the engagement and participation of primary school pupils? The question is broken down into three specific objectives. The first is to determine the effect of multimedia content (pictures, videos and audio) on pupils' understanding of concepts. The second is to assess the effect of educational games, counting activities and songs on pupils' interest and classroom participation. The third is to examine the effect of enlarged materials and audio resources on the participation of pupils with seeing and hearing difficulties.

1.1 Significance of the Review

The review is intended to be useful to three audiences. For policy makers in the Ministry and in local government, it indicates which kinds of tablet activity have evidence behind them and which do not, at a time when councils are being asked to buy more devices from their own revenue (The Citizen, 2026). For teachers and school leaders, it points to practical features of effective tablet sessions, such as regular routines, local-language content and active pupil roles.

For researchers, it identifies where Tanzanian evidence is missing and what kinds of study would fill those gaps. The review also contributes to the wider literature by treating engagement as the main outcome, rather than as a by-product of attainment.

2. Theoretical Framework

Three bodies of theory inform the review. The first is the cognitive theory of multimedia learning. Mayer (2021) argues that people learn more deeply from words and pictures together than from words alone, because verbal and visual channels are processed separately and have limited capacity. Well-designed multimedia lowers extraneous load and frees effort for making sense of the material. The theory predicts that pictures, animation and narration will aid understanding of concepts when they are closely matched to the learning goal, and will distract when they are decorative. This prediction is tested under the first objective.

The second is engagement theory. Fredricks et al. (2004) describe engagement as a multi-dimensional construct. Behavioural engagement concerns attendance, attention and taking part; emotional engagement concerns interest, enjoyment and belonging; cognitive engagement concerns willingness to invest effort in difficult ideas. Self-determination theory adds that activities which support a child's sense of competence and autonomy tend to produce more lasting interest (Ryan & Deci, 2000). Educational games and songs are usually justified on these grounds, since they give immediate feedback, a clear goal and a sense of progress. Hirsh-Pasek et al. (2015) caution, however, that many so-called educational apps are only entertaining; engagement that serves learning requires active, meaningful and socially interactive use. This distinction frames the second objective.

The third is Universal Design for Learning, which asks designers to give learners multiple means of representation, action and engagement from the start rather than adapting materials after the event (CAST, 2018). Adjustable text size, audio narration and captions are standard examples. The framework predicts that pupils with visual or hearing difficulties will participate more fully when content can be enlarged, heard or read, and it frames the third objective. The United Nations Convention on the Rights of Persons with Disabilities (United Nations, 2006) gives this a rights basis.

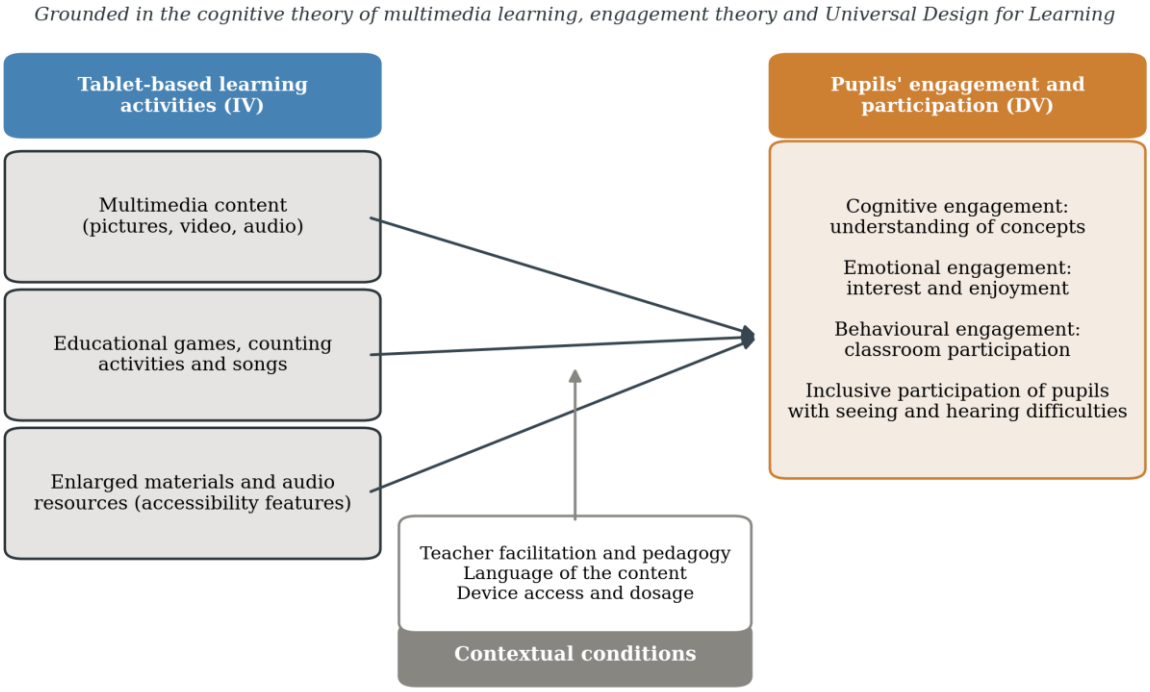
Figure 1 brings the three theories together. Tablet activities form the independent variable, engagement and participation the dependent variable, and teacher facilitation, content language and access form contextual conditions that may strengthen or weaken the relationship.

2.1 Operational Definitions

For clarity, the main terms were defined before screening. *Tablet-based learning activity* refers to any structured task that a pupil carries out on a touch-screen tablet or comparable mobile device, whether alone, in pairs or in small groups. *Multimedia content* refers to material that combines at least two of text, still images, animation, video and sound. *Educational games* are activities with explicit rules, goals and feedback, designed for learning; *counting activities* are tasks in which pupils enumerate, match or manipulate quantities; and *songs* are sung or chanted content set to music. *Engagement* follows Fredricks et al. (2004) and includes behavioural, emotional and cognitive dimensions, while *participation* refers to observable involvement in classroom activity, such as answering, attempting tasks, attending and working with others. *Pupils with seeing and hearing difficulties* include those with diagnosed visual or hearing impairment and those identified by teachers as having functional difficulty in these areas. *Enlarged materials* and *audio resources* refer to adjustable text and image size, magnification, narration, read-aloud functions and recorded audio.

Figure 1

Conceptual Framework Linking Tablet-Based Learning Activities to Pupils' Engagement and Participation



Note. Developed by the author from Mayer (2021), Fredricks et al. (2004) and CAST (2018).

3. Methods

3.1 Review Design and Reporting

The review followed the PRISMA 2020 statement for reporting systematic reviews (Page et al., 2021). A systematic rather than a scoping design was chosen because the objectives ask about effects and relationships, not only about the extent of the literature (Munn et al., 2018). Because the included studies varied in design, outcome and measure, a meta-analysis was not appropriate. Results were combined instead through a structured narrative synthesis, following the Synthesis Without Meta-analysis guideline (Campbell et al., 2020) and earlier guidance on narrative synthesis (Popay et al., 2006).

3.2 Eligibility Criteria

Studies were eligible if they met five conditions. The population was pupils in primary or early primary education (approximately ages 5 to 13), or their teachers reporting on pupils. The intervention involved pupils using tablets or comparable touch-screen mobile devices for learning activities, including multimedia content, games, counting activities, songs, or accessibility features such as enlarged text and audio. The comparison, where present, was ordinary classroom practice, a non-tablet activity or a different tablet activity. The outcomes were one or more aspects of engagement or participation, or understanding of concepts as a cognitive outcome. Designs could be experimental, quasi-experimental, observational, qualitative or mixed, and systematic reviews and meta-analyses were also admitted as evidence. Studies had to be published in English between 2010 and September 2026, the period in which tablets entered schools. Studies of higher education, studies that used desktops or laptops only, and opinion pieces without data were excluded.

3.3 Information Sources and Search Strategy

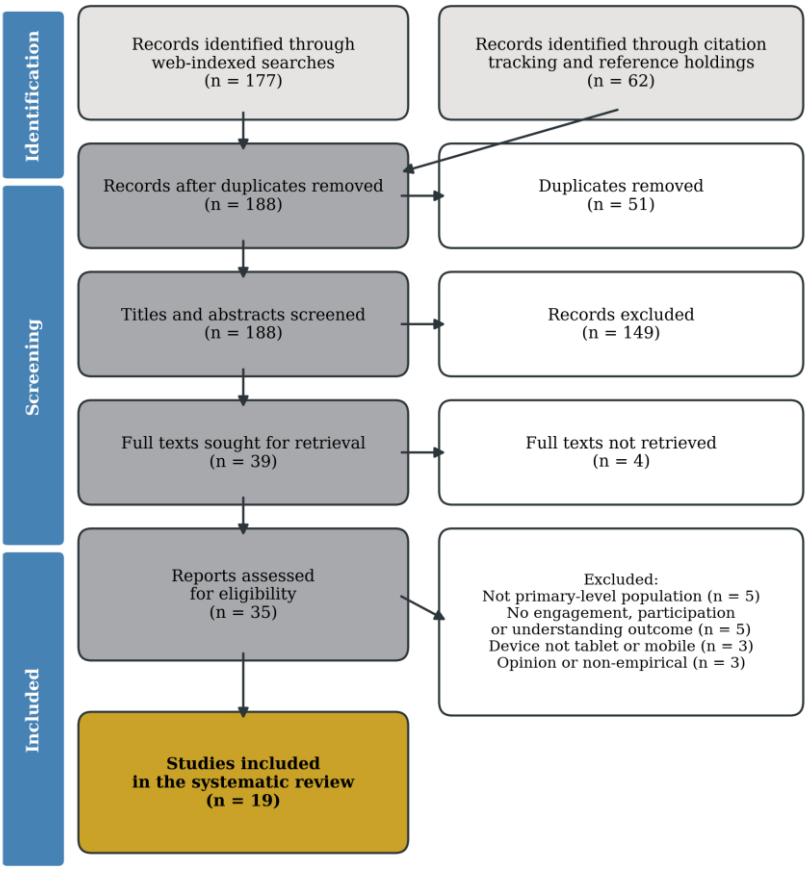
The search was carried out in September 2026. Searches were run through web-indexed scholarly search tools covering journal databases, publisher platforms, institutional repositories and open-access archives, including PubMed Central, ERIC, Taylor and Francis, Springer, Wiley, African Journals Online and East African open-access journals. Search strings combined three blocks of terms: device terms (*tablet*, *mobile device*, *EdTech*, *app*), setting terms (*primary school*, *early grade*, *pupils*) and outcome terms (*engagement*, *participation*, *attention*, *interest*, *understanding*, *disability*, *inclusion*). Country terms (*Tanzania*, *Malawi*, *Kenya*, *sub-Saharan Africa*) were added in some strings to raise the yield of regional studies. Grey literature, including technical reports by programme implementers and government documents, was sought because much African evidence in this field is not published in journals. Reference lists of key reviews were checked, and the author's reference holdings were searched for further studies.

3.4 Selection Process

All records were exported to a single file and duplicates were removed. Titles and abstracts were screened against the criteria, and full texts were then assessed. Reasons for exclusion at the full-text stage were recorded. Figure 2 shows the flow of records. The searches returned 177 records and citation tracking added 62. After removing 51 duplicates, 188 records were screened, 39 full texts were sought, four could not be retrieved, and 35 were assessed. Sixteen were excluded, leaving 19 studies.

Figure 2

PRISMA 2020 Flow Diagram of Study Selection



Adapted from PRISMA 2020 (Page et al., 2021)

3.5 Data Extraction and Quality Appraisal

A standard form captured author, year, country, design, sample, tablet activity, engagement-related outcome and main finding, together with the objective to which each study contributed. The Mixed Methods Appraisal Tool (MMAT; Hong et al., 2018) was used for primary studies because it applies one set of criteria across qualitative, quantitative and mixed designs. Reviews were judged on the clarity of their search, the transparency of their inclusion criteria and whether they assessed risk of bias. Studies were not excluded on quality grounds; instead, quality was used to weight the synthesis and to rate confidence in each conclusion.

3.6 Synthesis

Studies were grouped by objective. Within each group, the direction of effect, size of effect where reported, consistency across studies and study quality were considered together. Confidence in each conclusion was rated as high, moderate, low or very low, drawing on the logic of the GRADE approach: confidence was lowered for risk of bias, inconsistency, indirectness and imprecision.

4. Results

4.1 Characteristics of Included Studies

Table 1 summarises the 19 included studies. Five were randomised controlled trials, one was a large field trial, three used quasi-experimental or mixed designs, two were cross-sectional surveys, two were qualitative or case studies and one was a laboratory experiment. Five were systematic reviews or meta-analyses (Figure 3). Ten studies came from sub-Saharan Africa: Malawi (four), Tanzania (four, counting the combined Imagine Worldwide report here), Kenya (one) and Sierra Leone (one). Four came from England, New Zealand, Spain and the United States, and the five reviews drew on international samples. Most trials used the onebillion software, which delivers structured literacy and numeracy content in local languages on shared tablets without the need for internet access. This concentration is a strength, since it allows replication across settings, but it also limits how far the findings apply to other kinds of content.

Figure 3

Distribution of Included Studies by Research Design

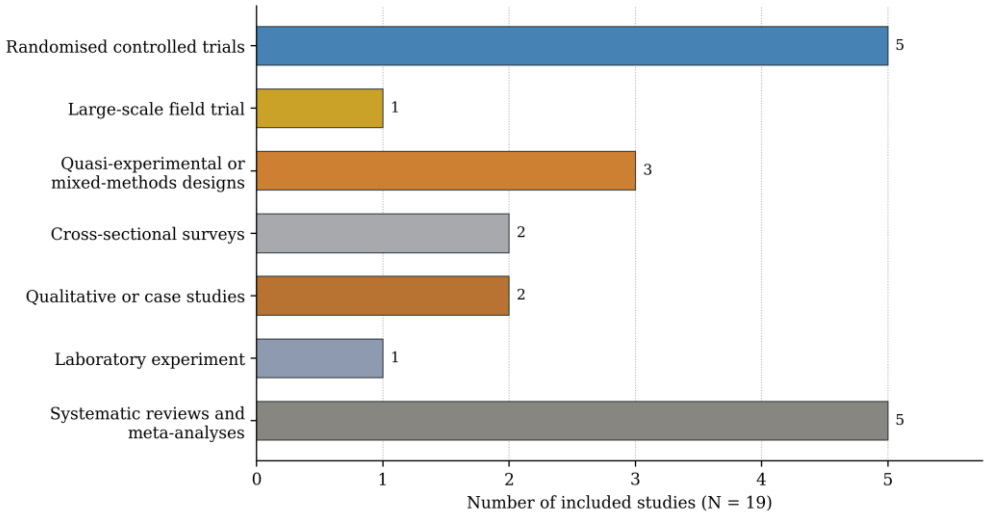


Table 1

Characteristics of the Included Studies

Study	Country	Design and sample	Tablet activity	Engagement or understanding outcome	Obj.
Pitchford (2015)	Malawi	RCT; Standards 1–3; n = 283 analysed	Interactive maths app, 30 min daily for 8 weeks	Gains in maths beyond face-to-face practice in Standards 2–3; transfer to paper tests	1
Outhwaite et al. (2019)	England	RCT; early years classes	Interactive maths apps with narration and animation	Higher maths achievement than usual practice	1
Pitchford et al. (2019)	Malawi	Analysis of trial data; early grades	Interactive maths apps	Girls and boys gained equally; no gender gap	2
Pitchford et al. (2018)	Malawi	Intervention study; pupils with SEND	Interactive maths apps	Learning of basic maths by pupils with special needs	3
Levesque et al. (2020)	Malawi	RCT; 8 months; government schools	onebillion literacy and numeracy course	Gains in literacy and early maths; similar for girls and boys	1, 2
Imagine Worldwide (2025): two-year trial	Malawi	RCT; n = 578 Standard 2 pupils	Literacy and numeracy apps in learning centre	Effect sizes of 0.37 (literacy) and 0.77 (maths)	1
Imagine Worldwide (2025): Nyarugusu trials	Tanzania	RCTs; n = 300 per trial; Grades 1–3	Adaptive Kiswahili software, 1 hour daily	Design documented; peer-reviewed outcomes not located	1, 2
XPRIZE Foundation (n.d.); onebillion (n.d.)	Tanzania	Field trial; 2,500 tablets; 141 villages	Autonomous Kiswahili literacy and numeracy apps	Children reading a word rose from under 10% to 45%	1, 2
Heinrich et al. (2020)	Kenya	Quasi-experimental, mixed methods	One-to-one tablets in rural schools	Engagement rose where teachers had capacity; access uneven	2

Study	Country	Design and sample	Tablet activity	Engagement or understanding outcome	Obj.
Mwakapemba et al. (2024)	Tanzania	Survey; n = 81 teachers	Teachers' use of tablets in class	Teachers saw tablets as making learning interactive and engaging	2
Prosper and Nderego (2024)	Tanzania	Survey; n = 130 primary teachers	Tablets in primary teaching	Broader content and new strategies; moderate competence	1
Zhang et al. (2015)	United States	Exploratory study; inclusive Grade 4 class	Maths apps with visual and audio support	Gains for struggling pupils and pupils with special needs	3
Falloon (2013)	New Zealand	Qualitative; 5-year-olds; screen capture	Literacy and numeracy apps	App design shaped whether pupils stayed on task	1, 2
Lurvink and Pitchford (2023)	Sierra Leone	Qualitative; policy makers, teachers, community	onebillion software in schools	Pupils motivated and eager; teachers valued structure	2
Salmerón et al. (2021)	Spain	Experiment; upper primary pupils	Reading on tablet versus paper	Comprehension slightly lower on screen for some texts	1
Dorris et al. (2024)	International	Systematic review of 18 RCTs	Mobile devices for literacy and numeracy	Pooled d = 0.24	1
Tamim et al. (2015)	International	Meta-analysis; 27 quantitative and 41 qualitative studies	Tablets and smart mobile devices	g+ = 0.23; g+ = 0.68 for student-centred use	1, 2
Haßler et al. (2016)	International	Critical review of 23 studies	Tablets in schools	Mostly positive outcomes; evidence fragmented	1, 2
Sung et al. (2016)	International	Meta-analysis of mobile learning studies	Mobile devices in teaching	Moderate positive effect on learning performance	1

Study	Country	Design and sample	Tablet activity	Engagement or understanding outcome	Obj.
Lynch et al. (2024)	LMICs	Systematic review; 51 articles	EdTech for pupils with disabilities	Positive examples, mainly special schools; weak efficacy evidence	3

Note. RCT = randomised controlled trial; SEND = special educational needs and disabilities; LMICs = low- and middle-income countries. Obj. = objective to which the study contributed. The two Imagine Worldwide entries are reported in one source and counted as one included study.

Appraisal with the MMAT showed that the trials were generally of good quality, with clear randomisation and low attrition, although none could blind pupils or teachers. The main weakness of the trial evidence was reliance on reports by programme implementers, some of which were not peer-reviewed. The two Tanzanian surveys used self-report with modest samples, and one relied on an online questionnaire that may have missed teachers with weaker digital access. Qualitative studies were well described but small. All five reviews reported their search and inclusion rules; two assessed risk of bias formally.

Table 3

Methodological Quality of Included Primary Studies (MMAT)

Study	MMAT category	Criteria met	Main concern
Pitchford (2015)	Randomised controlled trial	4 of 5	Blinding of assessors not possible; single school
Outhwaite et al. (2019)	Randomised controlled trial	4 of 5	High-income setting limits transfer
Pitchford et al. (2019)	Quantitative non-randomised	4 of 5	Secondary analysis of trial data
Pitchford et al. (2018)	Quantitative non-randomised	3 of 5	Mixed disability sample; no separate results by impairment
Levesque et al. (2020)	Randomised controlled trial	4 of 5	Implementer report, not peer-reviewed
Imagine Worldwide (2025)	Randomised controlled trial	3 of 5	Summary report; limited detail on analysis
XPRIZE Foundation (n.d.); onebillion (n.d.)	Quantitative descriptive	2 of 5	Outcomes reported by implementer and sponsor
Heinrich et al. (2020)	Mixed methods	4 of 5	Non-equivalent comparison group
Mwakapemba et al. (2024)	Quantitative descriptive	3 of 5	Online sample; self-report

Study	MMAT category	Criteria met	Main concern
Prosper and Nderego (2024)	Quantitative descriptive	3 of 5	Self-report; ten schools
Zhang et al. (2015)	Quantitative non-randomised	2 of 5	One class; no control group
Falloon (2013)	Qualitative	4 of 5	Small sample in one school
Lurvink and Pitchford (2023)	Qualitative	4 of 5	Early stage of implementation
Salmerón et al. (2021)	Randomised experiment	4 of 5	Short reading tasks; not classroom practice

Note. MMAT = Mixed Methods Appraisal Tool (Hong et al., 2018). Four or five criteria met was treated as high quality, three as moderate, and two or fewer as low.

4.2 Objective 1: Multimedia Content and Pupils' Understanding of Concepts

The evidence that interactive, multimedia content on tablets improves pupils' understanding of concepts is the strongest in the review. The first trial of onebillion's maths software took place in a Lilongwe primary school. Pitchford (2015) randomised 318 pupils in Standards 1 to 3 to a maths app, a non-maths app or ordinary practice. After eight weeks of 30 minutes a day, pupils in Standards 2 and 3 who used the maths app made larger gains than both comparison groups. In Standard 3 the gains carried over to paper-and-pencil tests, which suggests that pupils had learnt the concepts and not only how to operate the app. The non-maths tablet group did not gain in the same way, which shows that the device alone was not the active ingredient; the designed content was.

Later trials confirmed and extended this result. An eight-month trial in Malawian government schools found positive effects on overall literacy and key early maths skills (Levesque et al., 2020). A two-year trial with 578 Standard 2 pupils reported effect sizes of 0.37 in literacy and 0.77 in maths, despite school closures during the COVID-19 pandemic (Imagine Worldwide, 2025). In England, a trial of the same maths apps with young children also found higher achievement than usual practice (Outhwaite et al., 2019), which shows that the effect is not limited to low-resource settings. In Tanzania, the Global Learning XPRIZE field test placed about 2,500 tablets with children across 141 villages. The implementer reports that the share of children able to read a word in Kiswahili rose from under a tenth to 45% (onebillion, n.d.; XPRIZE Foundation, n.d.). These figures come from the implementer and should be read with care, but they show that pupils could work with Kiswahili multimedia content with little adult help.

The reviews give a wider picture. Dorris et al. (2024), in a Campbell review of 18 randomised trials in primary classrooms, found a small positive pooled effect on literacy and numeracy ($d = 0.24$), with most trials rated as having some concerns about bias. Tamim et al. (2015) found an average effect of $g+ = 0.23$ for tablet use compared with no tablet use, rising to $g+ = 0.68$ when more student-centred uses were compared with less student-centred ones. Sung et al. (2016) also reported a moderate positive effect of mobile devices on learning performance. Haßler et al. (2016) found that most studies they reviewed reported positive outcomes, but warned that the evidence was fragmented and that the conditions of use varied widely.

Not all multimedia helped. Falloon (2013), who recorded young children's screens as they worked, found that apps with unclear goals, distracting animations or weak feedback led

children off task, whereas apps with a clear learning pathway kept them focused. Salmerón et al. (2021) found that upper primary pupils understood some texts slightly less well on tablets than on paper. Taken together, these results fit the cognitive theory of multimedia learning: the benefit comes from multimedia that is tightly matched to a learning goal, not from the presence of pictures or sound as such (Mayer, 2021). In Tanzania, teachers report using tablets to show images, videos and diagrams and to broaden the content they can teach (Prosper & Nderego, 2024), but no Tanzanian study was found that measured pupils' conceptual understanding directly.

4.3 Objective 2: Games, Counting Activities, Songs and Pupils' Interest and Participation

The second objective concerns emotional and behavioural engagement. Here the evidence is consistent in direction but relies more on observation, teacher reports and indirect indicators such as attendance. The onebillion software is built around short games, counting tasks, songs and stories, with praise and rewards at each step. Across the Malawian trials, researchers reported that children's excitement about school, their attendance and their confidence as learners improved alongside learning gains (Levesque et al., 2020). In Sierra Leone, teachers, community members and policy makers described pupils as eager to take part and noted that the structured, game-like routine kept children engaged in crowded classrooms (Lurvink & Pitchford, 2023). In Tanzania, headteachers involved in the MsingiTek programme reported reduced absenteeism, and pupils themselves said the tablets had helped them learn to read, count and write (The Citizen, 2026). This last source is a news report and cannot carry causal weight, but it matches the pattern seen in the trials.

An important finding concerns who takes part. In many classrooms, boys dominate participation in mathematics. Pitchford et al. (2019), analysing data from Malawian trials, found that girls and boys made equal gains when learning through interactive apps, whereas a gender gap appeared under ordinary teaching. Levesque et al. (2020) reported similar results for girls and boys. A plausible explanation is that each child works through the same content at her own pace, so that quieter pupils are not crowded out by more confident peers. Tablet activities may therefore widen participation as well as raise it.

Other studies qualify this picture. In rural Kenya, Heinrich et al. (2020) found that pupils were more engaged where teachers understood how to use tablets for teaching, but that uneven access, weak teacher capacity and technical faults limited engagement elsewhere. Tamim et al. (2015) found larger effects when tablets were used in student-centred ways, which suggests that games and songs raise participation most when pupils are active rather than watching. Survey evidence from Tanzania points the same way. Teachers see tablets as making learning interactive and engaging (Mwakapemba et al., 2024), but this is teachers' perception rather than observed pupil behaviour. No included study isolated the effect of songs from that of games or counting activities, so conclusions apply to game-like activity packages as a whole.

4.4 Objective 3: Enlarged Materials, Audio Resources and Participation of Pupils with Seeing and Hearing Difficulties

The evidence for the third objective is the weakest. Lynch et al. (2024) reviewed 51 studies of educational technology for primary-aged learners with disabilities in low- and middle-income countries. They found positive examples, mostly in special schools, but judged the evidence of efficacy to be weak. Most studies were small and descriptive, few measured participation directly, and assistive devices such as screen readers and hearing aids were more often studied than general tablets with accessibility settings.

Two included studies bear on the question indirectly. Pitchford et al. (2018) found that children with special educational needs and disabilities in Malawi learnt basic mathematics from interactive apps, which suggests that audio narration and visual feedback can support pupils who struggle with ordinary classroom input. The sample, however, covered a range of disabilities, and the study did not report results separately for visual or hearing impairment. In

an inclusive Grade 4 class in the United States, Zhang et al. (2015) found that maths apps with visual and audio support helped struggling pupils and pupils with special needs to close part of the gap with their peers. Neither study tested enlarged text or audio features on their own.

No included study, in Tanzania or elsewhere, compared the participation of pupils with visual or hearing impairment with and without enlarged materials or audio resources on tablets. This is the clearest gap in the review. It matters because the same features that help one group may exclude another: audio narration helps a pupil with low vision but not a pupil who is deaf, and a design that relies on sound may make the tablet less usable for the latter. Universal Design for Learning argues for several means of representation at once for this reason (CAST, 2018).

4.5 Conditions that Shaped the Effects

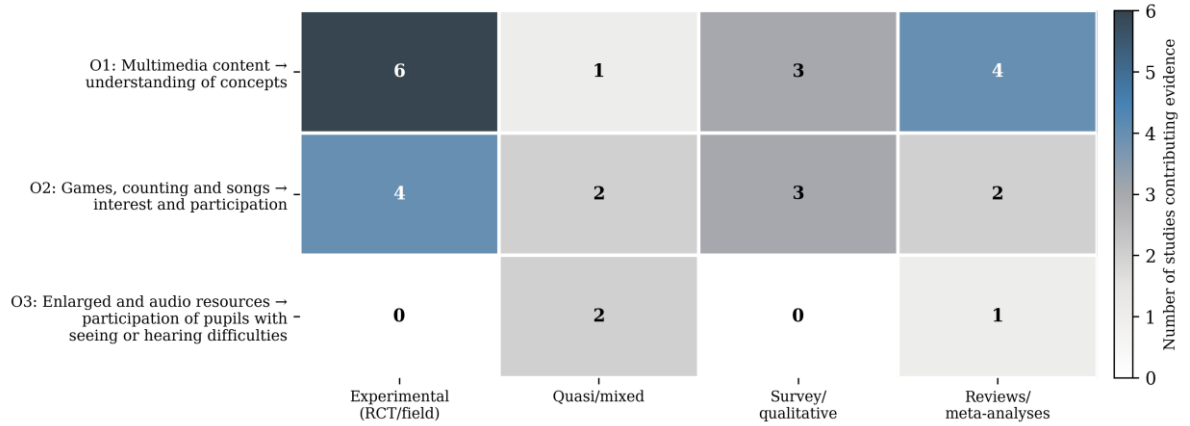
Four conditions recurred across the included studies and appear to moderate the influence of tablet activities. The first is the language of the content. The strongest African results came from software delivered in Chichewa or Kiswahili, the languages in which pupils are taught in the early grades (Imagine Worldwide, 2025; Pitchford, 2015). Where pupils do not understand the narration, multimedia loses much of its value. The second is dosage and routine. The trials that reported large gains used daily sessions of 30 to 60 minutes over months, not occasional use. The third is the role of the teacher. In Kenya, engagement rose only where teachers could organise tablet work and link it to classroom teaching (Heinrich et al., 2020), and in Sierra Leone teachers valued the structure that the software gave to their lessons (Lurvink & Pitchford, 2023). The fourth is access. Most African programmes used shared tablets, with several pupils rotating through each device in a day. Shared use did not prevent gains, but it placed a ceiling on how much practice each pupil received, and headteachers in Shinyanga have already reported shifts caused by rising enrolment (The Citizen, 2026). These four conditions correspond to the contextual box in Figure 1.

4.6 Summary of Findings and Confidence in the Evidence

Table 2 draws the results together. Figure 4 shows how the evidence for each objective is spread across types of study.

Figure 4

Evidence Map of Included Studies by Objective and Type of Evidence



Note. A study may contribute to more than one objective, so column totals exceed the number of included studies.

Table 2

Summary of Findings and Confidence in the Evidence

Objective	Summary of findings	Main reasons for rating	Confidence
1. Multimedia content → understanding of concepts	Interactive, goal-matched multimedia improves conceptual learning; decorative or poorly designed content does not	Several RCTs and reviews agree; many trials use one software family; implementer reports	Moderate
2. Games, counting and songs → interest and participation	Game-like activity packages raise interest, attendance and equal participation of girls and boys	Consistent direction; indirect measures; few observational studies of participation	Low to moderate
3. Enlarged and audio resources → participation of pupils with seeing or hearing difficulties	Promising examples, but no direct test of enlarged or audio features alone	Very few studies; indirect populations; no Tanzanian evidence	Very low

Note. Confidence ratings follow the logic of GRADE: high, moderate, low or very low.

5. Discussion

This review set out to establish how different tablet-based activities influence the engagement and participation of primary school pupils. The answer differs across the three objectives, and the differences are themselves informative.

For the first objective, the evidence suggests that tablets improve understanding of concepts when the content is interactive, well structured and closely tied to what pupils need to learn. This matches the cognitive theory of multimedia learning, which predicts gains from coherent words and pictures and losses from decorative detail (Mayer, 2021). The Malawian trial in which pupils who used tablets without maths content did not gain is especially telling (Pitchford, 2015). It shows that the device is a carrier; the learning comes from the content and the routine in which it is used. The effect sizes in the African trials were larger than the pooled estimates in the international reviews. One likely reason is that the comparison condition in large, under-resourced classes offers little individual practice, so any well-designed individual practice produces a large contrast. Another is that the software was delivered in a local language that children understood.

For the second objective, game-like activities appear to raise interest and participation, with the added benefit of reducing the gap between girls and boys (Pitchford et al., 2019). This fits self-determination theory: short tasks with immediate feedback support a sense of competence, and working at one's own pace supports autonomy (Ryan & Deci, 2000). Yet the evidence also supports the warning of Hirsh-Pasek et al. (2015) that engagement is not the same as learning. The Kenyan findings show that games alone did not ensure participation where teachers lacked the skill to organise tablet use (Heinrich et al., 2020). Engagement produced by novelty may also fade. None of the included studies followed engagement beyond two years, so it is not known whether pupils' interest lasts once tablets become ordinary.

For the third objective, the gap between policy claims and evidence is wide. Tablets are often promoted as tools for inclusion, and their built-in accessibility settings make this plausible. The review found, however, no direct test of whether enlarged materials or audio resources change the participation of pupils with seeing or hearing difficulties. This finding is consistent with that of Lynch et al. (2024), who called for better-designed studies in ordinary schools. For Tanzania, where most pupils with disabilities who attend school do so in ordinary classrooms, this is a serious gap.

5.1 Comparison with Earlier Reviews

The present findings agree with, and add to, earlier syntheses. Haßler et al. (2016) concluded that tablet studies were mostly positive but fragmented, and that the way devices were used mattered more than the devices themselves. The present review supports this conclusion and makes it more specific by showing that interactive, goal-matched content drives gains in understanding, while game-like packages drive interest and attendance. Tamim et al. (2015) found larger effects for student-centred uses, and the African trials, in which each pupil works actively through content, fit this pattern. Dorris et al. (2024) reported a smaller pooled effect than several of the African trials. The difference may reflect the higher-income settings of many trials in their review, where the ordinary classroom already offers more individual practice. The present review departs from earlier reviews in one respect. By placing engagement, rather than attainment, at the centre, it shows that the evidence on participation, and especially on the participation of pupils with disabilities, is much weaker than the evidence on test scores. Policy statements that treat tablets as tools for inclusion should therefore be read as aspirations rather than as findings.

5.2 How Tablet Activities May Work: A Tentative Mechanism

Drawing the three objectives together, a tentative mechanism can be proposed. Tablet activities appear to work through three linked routes. The first is increased practice: each pupil completes many more items per session than would be possible in a class of eighty or more. The second is immediate feedback, which corrects errors before they become fixed and supports a sense of competence. The third is a shift in the social conditions of participation, since pupils who rarely speak in front of the class can succeed privately on a screen. Each route depends on conditions. Practice helps only when content is at the right level and in a language the pupil understands. Feedback helps only when it is informative rather than merely rewarding. Private success turns into wider participation only when teachers link tablet work to classroom talk. These conditions help to explain why the same device produces strong effects in some studies and weak effects in others, and they give future Tanzanian studies clear variables to measure.

5.3 Implications for Practice and Policy in Tanzania

Four implications follow. First, the choice of software matters more than the choice of device. Content should be interactive, aligned to the national curriculum and delivered in Kiswahili for the early grades. Second, tablet sessions should be scheduled as a regular, protected routine, as in the trials, rather than as an occasional treat. Third, teachers need guidance on how to organise pupils around shared tablets so that all children, including girls and less confident pupils, take an active part. Fourth, programmes such as MsingiTek should build in the tracking of pupils with disabilities and test accessibility features, rather than assume their benefit.

Table 4 translates these findings into design principles for tablet sessions in Tanzanian primary schools. Each principle is linked to the evidence from which it is drawn and to the strength of that evidence.

Table 4

Evidence-Informed Principles for Tablet Sessions in Tanzanian Primary Schools

Principle	Evidence basis	Strength of support
Use interactive content matched to curriculum goals, not decorative media	Pitchford (2015); Falloon (2013); Mayer (2021)	Moderate
Deliver early-grade content in Kiswahili	Malawian and Tanzanian trials in local languages (Imagine Worldwide, 2025)	Moderate
Schedule daily or near-daily sessions of 30 to 60 minutes	Dosage in effective trials (Levesque et al., 2020; Pitchford, 2015)	Moderate
Organise rotation so every pupil has hands-on time, including girls and quieter pupils	Pitchford et al. (2019); Heinrich et al. (2020)	Low to moderate
Link tablet work to whole-class discussion	Tamim et al. (2015); Lurvink and Pitchford (2023)	Low
Enable text enlargement, narration and captions, and monitor use by pupils with disabilities	CAST (2018); Lynch et al. (2024)	Very low (untested)

Two further cautions apply. The first concerns screen time and child welfare. The effective programmes limited sessions to about an hour a day and kept tablets in school, which avoids the concerns raised about long, unsupervised screen use by young children. Programmes that allow devices to be taken home, or that extend sessions to fill staffing gaps, move beyond what the evidence supports. The second concerns data. Adaptive software records each child's responses, and cloud-based applications may transfer those data outside the country. Schools and councils should know what data are collected, where they are stored and who can use them, and consent procedures should be agreed with parents before large-scale use. Neither caution argues against tablets; both argue for deliberate choices about how they are used.

5.4 Implications for Research

Three lines of research are needed. The first is Tanzanian trials that measure engagement directly, through classroom observation and validated pupil scales, not only through test scores. The second is studies that separate the components of tablet activity packages, for example comparing games with and without songs, to establish which parts drive participation. The third is studies of pupils with visual and hearing impairment in ordinary Tanzanian classrooms, comparing participation with and without enlarged and audio features. Mixed-methods designs would allow survey measures of engagement to be combined with pupils' and teachers' own accounts.

5.5 Limitations

The review has several limitations. Searches were run through web-indexed tools rather than through direct searches of subscription databases such as Scopus and Web of Science, so some studies may have been missed. Screening and appraisal were carried out by a single reviewer, which raises the risk of error in selection and judgement. Several of the strongest studies came from one software family and were reported by the implementing organisation,

which may introduce bias towards positive findings. Only English-language studies were included, so studies in Kiswahili or French may have been missed. Finally, engagement was measured in many different ways, which ruled out a meta-analysis.

6. Conclusion

Tablet-based learning activities can raise the engagement and participation of primary school pupils, but the effect depends on what pupils do with the device. The evidence is strongest for interactive, well-designed multimedia content, which improves understanding of concepts, and reasonably consistent for game-like activities, which raise interest and make participation more equal between girls and boys. The claim that enlarged materials and audio resources improve the participation of pupils with seeing and hearing difficulties is plausible but untested. For Tanzania, the priority is to pair the current expansion of tablets with content in Kiswahili, regular structured routines, teacher guidance and research designed to test the inclusion claim directly.

More broadly, the review shows the value of asking what pupils actually do with a technology rather than whether the technology is present. The same tablet can be a tool for focused practice, a source of distraction or an idle object in a cupboard. Which of these it becomes depends on content, routine, teacher support and access, all of which lie within the control of schools and education authorities. Future investment decisions in Tanzania would benefit from treating these conditions as part of the intervention, and from building evaluation into roll-out so that the country generates its own evidence on engagement and inclusion.

Declarations

Funding: This review received no specific funding. **Conflict of interest:** The author declares no conflict of interest. **Data availability:** The extraction form and screening log are available from the author on reasonable request.

Appendix A

Search Strings Used in the Review

Table A1

Search Strings by Concept Block

Block	Terms combined with OR within blocks, and with AND across blocks
Device	tablet *OR "mobile device*" OR iPad OR "touch-screen" OR app* OR EdTech OR onebillion OR "digital learning"
Setting	"primary school*" OR "early grade*" OR pupil *OR "elementary school*" OR "Standard 1" OR "Grade 1"
Outcome	engag *OR participat* OR attention OR interest OR motivat *OR understanding OR attendance OR absentee*
Activity	multimedia OR video OR audio OR picture *OR game* OR counting OR song* OR music
Inclusion	disabilit *OR "visual impairment" OR "hearing impairment" OR "special educational needs" OR accessib* OR inclusive
Context (optional)	Tanzania OR Malawi OR Kenya OR Uganda OR "Sierra Leone" OR "sub-Saharan Africa" OR "low- and middle-income"

Note. Strings were adapted to the syntax of each search tool. The optional context block was used to raise the yield of regional studies and was dropped in global searches.

References

Campbell, M., McKenzie, J. E., Sowden, A., Katikireddi, S. V., Brennan, S. E., Ellis, S., Hartmann-Boyce, J., Ryan, R., Shepperd, S., Thomas, J., Welch, V., & Thomson, H. (2020). Synthesis without meta-analysis (SWiM) in systematic reviews: Reporting guideline. *BMJ, 368*, l6890. https://doi.org/10.1136/bmj.l6890

CAST. (2018). *Universal Design for Learning guidelines version 2.2*. http://udlguidelines.cast.org

Dorris, C., Winter, K., O'Hare, L., & Lwoga, E. T. (2024). A systematic review of mobile device use in the primary school classroom and impact on pupil literacy and numeracy attainment: A systematic review. *Campbell Systematic Reviews, 20*(2), e1417. https://doi.org/10.1002/cl2.1417

Falloon, G. (2013). Young students using iPads: App design and content influences on their learning pathways. *Computers & Education, 68*, 505–521. https://doi.org/10.1016/j.compedu.2013.06.006

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*(1), 59–109. https://doi.org/10.3102/00346543074001059

Global Partnership for Education. (2025, January 28). *Improving foundational learning using technology in Malawi: The role of data, evidence and partnerships*. https://www.globalpartnership.org/blog/improving-foundational-learning-using-technology-malawi-role-data-evidence-and-partnerships

Haßler, B., Major, L., & Hennessy, S. (2016). Tablet use in schools: A critical review of the evidence for learning outcomes. *Journal of Computer Assisted Learning, 32*(2), 139–156. https://doi.org/10.1111/jcal.12123

Heinrich, C. J., Darling-Aduana, J., & Martin, C. (2020). The potential and prerequisites of effective tablet integration in rural Kenya. *British Journal of Educational Technology, 51*(2), 498–514. https://doi.org/10.1111/bjet.12870

Hirsh-Pasek, K., Zosh, J. M., Golinkoff, R. M., Gray, J. H., Robb, M. B., & Kaufman, J. (2015). Putting education in "educational" apps: Lessons from the science of learning. *Psychological Science in the Public Interest, 16*(1), 3–34. https://doi.org/10.1177/1529100615569721

Hong, Q. N., Fàbregues, S., Bartlett, G., Boardman, F., Cargo, M., Dagenais, P., Gagnon, M.-P., Griffiths, F., Nicolau, B., O'Cathain, A., Rousseau, M.-C., Vedel, I., & Pluye, P. (2018). The Mixed Methods Appraisal Tool (MMAT) version 2018 for information professionals and researchers. *Education for Information, 34*(4), 285–291. https://doi.org/10.3233/EFI-180221

Imagine Worldwide. (2025). *Rigorous studies of onebillion's software: Summary*. https://www.imagineworldwide.org/wp-content/uploads/Rigorous-Studies-of-onebillions-Software-narrative-updated-October-2025.pdf

Levesque, K., Bardack, S., & Chigeda, A. (2020). *Technical report: Tablet-based learning for foundational literacy and math: An 8-month RCT in Malawi*. Imagine Worldwide. https://www.imagineworldwide.org/resource/tablet-based-learning-for-foundational-literacy-and-math-an-8-month-rct-in-malawi/

Lurvink, A.-F., & Pitchford, N. J. (2023). Introduction of an EdTech intervention to support learning of foundational skills in Sierra Leone: Policy, teacher, and community perspectives. *Frontiers in Education, 8*, 1069857. https://doi.org/10.3389/feduc.2023.1069857

Lynch, P., Singal, N., & Francis, G. A. (2024). Educational technology for learners with disabilities in primary school settings in low- and middle-income countries: A systematic literature review. *Educational Review, 76*(2), 405–431. https://doi.org/10.1080/00131911.2022.2035685

Mayer, R. E. (2021). *Multimedia learning* (3rd ed.). Cambridge University Press.

Ministry of Education and Vocational Training. (2007). *Information and communication technology (ICT) policy for basic education*. United Republic of Tanzania.

Ministry of Education, Science and Technology. (2023). *Education and training policy 2014, 2023 edition*. United Republic of Tanzania.

Ministry of Education, Science and Technology. (2024). *National digital education strategy 2024–2030* [Draft]. United Republic of Tanzania. https://www.moe.go.tz/sites/default/files/Draft_National_Digital_Education_Strategy%202024-2030-2.pdf

Munn, Z., Peters, M. D. J., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Medical Research Methodology, 18*, 143. https://doi.org/10.1186/s12874-018-0611-x

Murithi, J., & Yoo, J. E. (2021). Teachers' use of ICT in implementing the competency-based curriculum in Kenyan public primary schools. *Innovation and Education, 3*, 5. https://doi.org/10.1186/s42862-021-00012-0

Mwakapemba, J. L., Phabiano, E., & Retnawati, H. (2024). Teachers' perceptions towards the utilization of tablets for educational purposes in Tanzania. *Jurnal Penelitian Pendidikan IPA, 10*(3), 1331–1339. https://doi.org/10.29303/jppipa.v10i3.7085

onebillion. (n.d.). *Research evidence for effectiveness of onecourse*. Retrieved September 23, 2026, from https://onebillion.org/impact/evidence/

Outhwaite, L. A., Faulder, M., Gulliford, A., & Pitchford, N. J. (2019). Raising early achievement in math with interactive apps: A randomized control trial. *Journal of Educational Psychology, 111*(2), 284–298. https://doi.org/10.1037/edu0000286

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., . . . Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ, 372*, n71. https://doi.org/10.1136/bmj.n71

Pitchford, N. J. (2015). Development of early mathematical skills with a tablet intervention: A randomized control trial in Malawi. *Frontiers in Psychology, 6*, 485. https://doi.org/10.3389/fpsyg.2015.00485

Pitchford, N. J., Chigeda, A., & Hubber, P. J. (2019). Interactive apps prevent gender discrepancies in early-grade mathematics in a low-income country in sub-Sahara Africa. *Developmental Science, 22*(5), e12864. https://doi.org/10.1111/desc.12864

Pitchford, N. J., Kamchedzera, E., Hubber, P. J., & Chigeda, A. L. (2018). Interactive apps promote learning of basic mathematics in children with special educational needs and disabilities. *Frontiers in Psychology, 9*, 262. https://doi.org/10.3389/fpsyg.2018.00262

Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., Britten, N., Roen, K., & Duffy, S. (2006). *Guidance on the conduct of narrative synthesis in systematic reviews*. ESRC Methods Programme.

Prosper, A., & Nderego, E. F. (2024). The use of tablets in teaching: Examining competencies, challenges and opportunities among public primary school teachers in Tanzania. *East African Journal of Interdisciplinary Studies, 7*(1), 444–457. https://doi.org/10.37284/eajis.7.1.2426

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Salmerón, L., Delgado, P., Vargas, C., & Gil, L. (2021). Tablets for all? Testing the screen inferiority effect with upper primary school students. *Learning and Individual Differences, 86*, 101975. https://doi.org/10.1016/j.lindif.2021.101975

Sung, Y.-T., Chang, K.-E., & Liu, T.-C. (2016). The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. *Computers & Education, 94*, 252–275. https://doi.org/10.1016/j.compedu.2015.11.008

Tamim, R. M., Borokhovski, E., Pickup, D., Bernard, R. M., & El Saadi, L. (2015). *Tablets for teaching and learning: A systematic review and meta-analysis*. Commonwealth of Learning. https://oasis.col.org/items/ab335462-5583-4a64-87eb-d2a671b2fdf5

The Citizen. (2022, May 6). *Revealed: 371 pupils share one ICT tool in Tanzania*. https://www.thecitizen.co.tz/tanzania/news/national/revealed-371-pupils-share-one-ict-tool-in-tanzania-3805046

The Citizen. (2026, September 18). *Shinyanga councils directed to increase number of tablets in schools*. https://www.thecitizen.co.tz/tanzania/news/national/shinyanga-councils-directed-to-increase-number-of-tablets-in-schools-5599472

United Nations. (2006). *Convention on the Rights of Persons with Disabilities*. United Nations.

XPRIZE Foundation. (n.d.). *Global Learning XPRIZE*. Retrieved September 23, 2026, from https://www.xprize.org/competitions/global-learning

Zhang, M., Trussell, R. P., Gallegos, B., & Asam, R. R. (2015). Using math apps for improving student learning: An exploratory study in an inclusive fourth grade classroom. *TechTrends, 59*(2), 32–39. https://doi.org/10.1007/s11528-015-0837-y