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EXPLORING THE EFFECTS OF INTEGRATING DIGITAL TECHNOLOGY ON LEARNER MOTIVATION TO LEARN MAP WORK IN SECONDARY SCHOOLS IN RONGO SUB-COUNTY, KENYA

Repha Adoyo Uhuru

Maseno University, department of educational communication, technology and curriculum studies
P.O Box 333, MASENO (KENYA) – 40105

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ABSTRACT

Map work questions are compulsory in the KCSE Geography Paper 1 examination and are essential for acquiring spatial skills. KNEC reports from 2021 to 2024 indicate that learners continue to experience difficulties in map work, with Rongo Sub-County recording particularly low outcomes. These challenges have been associated with traditional teaching approaches that rely heavily on two-dimensional topographical maps, which often make map work difficult and reduce learners' interest and willingness to engage with the topic. Although digital technology has enhanced learning in many subject areas, its use in Geography map work remains limited, particularly the use of YouTube videos and internet images. Consequently, little is known about how these digital technologies influence learners' motivation to learn map work in secondary schools, especially in Rongo Sub-County, Kenya. Guided by constructivist theory, which emphasizes that learners actively construct knowledge through interaction with learning materials and experiences, this study aimed to investigate the impact of digital technology on learners' motivation to learn map work in secondary schools in Rongo Sub-County. A quasi-experimental Solomon four-group nonequivalent design was employed. The study sampled four schools from a target population of 1,170 learners from 39 secondary schools, yielding a sample size of 161 learners. Data on learners' motivation to learn map work were collected using a motivation questionnaire. A pilot study involving 16 learners, representing 10% of the sample size, was conducted in a school that was not included in the final study. The instrument was validated through face, content, and construct validation, while reliability was established using Cronbach's alpha coefficient of 0.91. The findings revealed that the integration of digital technology significantly improved learners' motivation to learn map work. The experimental group recorded substantial increases across the ARCS motivation dimensions of attention, relevance, confidence, and satisfaction, with mean scores improving from 3.02–3.10 during the pretest to 4.25–4.43 during the posttest. Learners exposed to YouTube videos and internet images demonstrated greater interest, enthusiasm, confidence, and satisfaction in learning map work compared to learners taught using conventional instructional methods. These findings support constructivist theory by showing that digital technologies provide interactive and meaningful learning experiences that enhance learners' motivation to learn map work.

The study recommends that Geography teachers integrate digital technologies such as YouTube videos and internet images into map work instruction to enhance learners' motivation to learn map work. Additionally, teacher training programmes should strengthen teachers' digital pedagogical competencies to support effective technology integration in Geography classrooms.

KEYWORDS: Map Work, Digital Technology Integration, Motivation, Topographical Maps, Secondary Schools, Spatial Thinking, YouTube and Internet Images.

1. INTRODUCTION

The teaching and learning of Geography, particularly topographical map work, requires learners to develop spatial thinking skills that enable them to interpret three-dimensional (3D) landscapes from two-dimensional (2D) representations (Atit et al., 2017). Spatial thinking is a core requirement in map work because learners must translate abstract symbols, such as contour lines, into meaningful representations of real-world landforms. Constructivist learning theory explains that such complex cognitive skills are best developed when learners actively engage with learning materials and interact with mediating tools that support knowledge construction rather than passive reception of information (Tshibalo, 2021). In the context of map work learning, mediating tools are particularly important because learners are required to visualise elevation, slope, relief, and landform relationships, tasks that are cognitively demanding for many secondary school learners (Uttal et al., 2019).

Learner motivation plays a critical role in the learning process, especially when students are exposed to abstract and cognitively demanding content such as topographical map work. Motivation refers to learners' internal drive, interest, and willingness to engage in learning tasks (Schunk & DiBenedetto, 2020). When learners perceive map work as difficult or confusing, they may develop anxiety, low self-efficacy, and reduced interest, which negatively affects their willingness to learn map-related concepts. Research on spatial learning shows that learners often struggle with interpreting complex cartographic elements such as contour patterns, slope gradients, and cross-section drawing, which can reduce persistence and effort in learning (Larkin & Simon, 1987; Gobert & Buckley, 2000). In teacher-centred instructional environments, limited learner interaction with visual and spatial representations may further weaken motivation. Studies in Geography education have also shown that learners often find map work challenging because of its abstract nature and heavy reliance on spatial reasoning skills (Wiegand, 2006; Bednarz & Lee, 2011). However, much of the existing research on motivation has focused broadly on classroom learning rather than specifically on topographical map work. Consequently, it remains unclear how instructional approaches in Kenyan secondary schools' influence learners' motivation to learn map work.

Across different educational contexts, learners commonly experience difficulties in interpreting contour lines, constructing cross-sections, and relating map symbols to real-world features. These challenges often reduce learners' interest, confidence, and willingness to learn Geography, particularly map work (Newcombe, 2020; Uttal et al., 2013). Such difficulties suggest that map work remains a

cognitively demanding component of Geography education and highlight the need for instructional approaches that can strengthen learners' motivation to learn map work.

Despite policy efforts to promote learner-centred and technology-enhanced instruction, teacher-centred practices continue to dominate many Kenyan secondary school classrooms (Ndungu & Chege, 2019; Ministry of Education, 2020). Such instructional approaches provide limited opportunities for learners to interact actively with learning materials and concepts, thereby reducing motivation to learn abstract topics such as topographical map work. Existing instructional practices may therefore be inadequate in supporting the motivational processes required for successful learning of map work concepts.

Research conducted in developed countries suggests that digital technologies such as videos, animations, and visual simulations can make learning more interesting and meaningful by helping learners visualise abstract concepts more effectively (Ontong, 2020; Atit et al., 2017). Through repeated visual demonstrations and real-world representations, these technologies can increase learners' interest, confidence, and willingness to engage with learning tasks. However, most of these studies have been conducted in contexts with advanced technological infrastructure and educational resources that differ significantly from those available in many Kenyan secondary schools. Consequently, it remains unclear whether simple and affordable digital technologies such as YouTube videos and internet images can enhance learners' motivation to learn map work in resource-constrained schools such as those in Rongo Sub-County.

In Migori County, and particularly in Rongo Sub-County, Geography instruction continues to rely largely on traditional teaching approaches with minimal integration of accessible digital technologies (Ministry of Education, 2020). Although there have been isolated cases of technology use in Geography teaching, their effectiveness in enhancing learners' motivation to learn map work has not been empirically established. Reports from the Ministry of Education indicate that many teachers continue to use teacher-centred instructional approaches, limiting opportunities for learners to experience interactive and motivating learning environments (Ministry of Education, 2020; Ndungu & Chege, 2019). This gap is especially evident in relation to learners' motivation to learn abstract map work concepts. There remains limited evidence on how low-cost and readily available digital technologies such as YouTube videos and internet images can be used to improve learners' interest, confidence, relevance perceptions, and satisfaction in learning map work. Therefore, there is a need to investigate the effect of these digital technologies on learners' motivation to learn map work in secondary schools in Rongo Sub-County, Kenya.

2. REVIEW OF RELATED LITERATURE

In his 2021 study, Halat investigated how 4th and 5th-grade students perceived the use of Web Quests in their classroom. Web Quests, which are lessons where all information is sourced from the internet, were designed using the FrontPage software for this research. After students completed their Web

Quests, they were asked to fill out a questionnaire. The results indicated that the students enjoyed the Web Quest activities and felt more motivated to learn. The study also found that the use of Web Quests helped to address several challenges faced in traditional education, with students reporting a better understanding of the material (Zainuddin et al., 2020).

In a prior study, Heafner (2020) explored how technology influences student motivation in a social studies setting. The participants, 9th and 10th graders, were studying World History, as well as Economic, Legal, and Political Systems. For their assignment, students were asked to create a PowerPoint slide. Although their behavior in the classroom and hallways was typical, a noticeable change occurred once they entered the computer lab. The students became noticeably more excited about learning, showing greater enthusiasm and pride in their work. All the students reported enjoying the task and indicated that it increased their motivation (Bond et al., 2020).

Most studies on technology and learner motivation have focused on general classroom learning rather than specific subject areas such as geography map work. For instance, Heafner (2020) in *“Technology Integration and Student Motivation in Social Studies Classrooms”* examined how digital tools such as PowerPoint presentations enhance student engagement in social studies. Similarly, Godzicki and Michaels (2021) in *“Impact of Digital Technology on Student Engagement in K–8 Classrooms”* found that the use of digital tools across subjects increases student motivation and participation. Halat (2021), in *“WebQuest-Based Learning and Student Motivation,”* also reported improved learner motivation through internet-based inquiry learning activities.

Although these studies demonstrate that technology enhances student motivation, they mainly address general classroom learning contexts and broad subject areas rather than specific Geography competencies such as map work. None of these studies explicitly examined how YouTube videos and internet images influence learner motivation in structured map work activities.

Moreover, although research on technology in Geography education has increased, studies such as Egiebor and Foster (2019) and Green et al. (2019) have focused on advanced digital tools such as GIS systems and geospatial learning platforms such as Story Maps and mapathons. However, no study has specifically investigated the effect of YouTube videos and internet images on students’ motivation in map work learning in secondary schools.

In addition, this study employed the Reduced Instructional Materials Motivation Survey (RIMMS) developed by Keller (2010) to assess learners’ motivational responses to instructional materials. RIMMS is a shortened version of the Instructional Materials Motivation Survey (IMMS) and is designed to measure learner motivation based on the four components of the ARCS model: attention, relevance, confidence, and satisfaction. The instrument is a self-report measure used to evaluate learners’ motivational reactions to specific instructional materials within a given learning context (Keller, 2010). In this study, the RIMMS consisted of 12 items organized into four subscales, with

each subscale containing three items representing attention, relevance, confidence, and satisfaction. The instrument was adapted to examine the effect of YouTube videos and internet images on learners' motivation in map work. Several instruments have been developed to assess learner motivation in educational settings, including the Academic Self-Concept Scale (Reynolds, 1988), the Downing Self-Assessment Questionnaire (Downing, 2005), the Learning and Study Strategies Inventory (Weinstein, 1987), and the Academic Self-Concept Scale by Findley and Galliher (2007). These instruments assess motivation through learners' academic beliefs, study strategies, self-regulation, responsibility, and confidence in their ability to succeed. However, the present study adopted the Attention, Relevance, Confidence, and Satisfaction (ARCS) model developed by Keller (1987) because it specifically explains how instructional materials and teaching approaches influence learner motivation.

Although several studies have examined the relationship between digital technology and learner motivation, important gaps remain when these findings are considered in relation to Geography map work in secondary schools. First, there is a contextual gap. For example, Egiebor and Foster (2019) found that integrating GIS Story Maps into geography instruction increases learner engagement and participation. Similarly, Green et al. (2019) found that participatory mapping activities such as mapathons improve learner motivation and collaboration. However, these studies were conducted in higher education environments where digital infrastructure, GIS platforms, and stable internet access were available. This creates a contextual gap in understanding whether similar motivational effects would occur in under-resourced secondary school geography classrooms.

Second there is subject specific gaps, Al-Marroof and Al-Emran (2018) found that digital video platforms such as YouTube improve student engagement and perceived usefulness in learning environments. However, the focus of such studies is on general digital learning acceptance rather than structured geography map work tasks such as interpreting contour lines, scale, and relief features. Similarly, Green et al. (2019) focused on collaborative GIS-based mapping activities rather than simple instructional tools such as YouTube videos and internet images. Therefore, these studies do not fully address motivation in structured map work learning

Halat (2018) investigated WebQuest-based learning in *WebQuest Applications in Elementary Education* and found that internet-based inquiry learning improved learner motivation and understanding. Deterding et al. (2011) in *From Game Design Elements to Gamefulness: Defining Gamification* and Hamari et al. (2014) in *Does Gamification Work? — A Literature Review of Empirical Studies* found that gamification elements such as points, badges, and rewards increase user engagement in digital environments. However, these studies focus on structured gamified systems and online platforms, not simple instructional tools such as YouTube videos and internet images, which are more commonly used in secondary schools due to their accessibility and low cost. This leaves a gap in understanding how these basic digital resources such as Youtube and internet images influence learner motivation in map work.

Digital literacy in Kenyan secondary schools has been associated with learner motivation, although its impact is often limited by implementation challenges. Research on digital technology integration in education shows that when technology is used effectively in teaching, it can increase learners' interest, attention, and participation in learning activities (Kozma, 2003; Ertmer & Ottenbreit-Leftwich, 2010). However, a key gap in this body of literature is that most studies focus on general digital technology integration in teaching and learning and do not clearly explain how specific digital tools influence learner motivation in subject-specific classroom contexts such as geography map work. KICD (2017) reports that many secondary schools still rely heavily on traditional teaching methods, which limits opportunities for learners to experience engaging and motivating digital learning environments. In addition, studies on teacher digital competence (Mishra & Koehler, 2006; UNESCO, 2018) show that many teachers lack adequate digital skills, which reduces their ability to design motivating and interactive lessons that sustain learner interest. Despite these findings, there is limited empirical evidence showing how teacher digital technology competence directly translates into measurable changes in learner motivation during specific learning tasks such as map work activities.

Further evidence from Kenyan education reports such as Kenya Institute of Curriculum Development (KICD, 2017) indicates that low levels of digital technology integration contribute to passive learning environments, where learners often have limited engagement and reduced motivation. This is particularly important because motivation in secondary schools is strongly linked to active participation and learner-centered instruction (Ryan & Deci, 2000). When learners are exposed mainly to teacher-centered methods, their interest and persistence in learning tend to decline. However, a gap exists in that most of these reports describe general classroom conditions without isolating geography learning processes, particularly map work, where learners require spatial reasoning and interpretive skills that may respond differently to digital technology use.

This study focused on the effect of digital technology on learners' motivation in Geography map work in Kenyan secondary schools, specifically in Rongo Sub-County. It specifically examined how YouTube videos and internet images influence learners' attention, interest, engagement, and overall motivation during map work lessons. Guided by the ARCS model of motivation (Keller, 1987) and measured using the RIMMS instrument (Keller, 2010), the study sought to determine whether the use of these digital tools enhances learner motivation compared to traditional teaching methods. By addressing gaps identified in previous studies, particularly the limited focus on specific digital tools and subject-specific contexts, the study aims to provide empirical evidence on how accessible digital technologies can improve motivation in Geography map work learning in Rongo Sub-County.

3. MATERIALS AND METHODS

A quasi-experimental research design was used to collect data. This design was suitable because the study was carried out in real classroom settings where it was not possible to randomly place learners into new groups. Instead, the study used intact classes from selected secondary schools. This quasi-experimental approach, specifically the Solomon Four Non-Equivalent Group Design, was used to

reduce common research problems such as pre-test sensitization and differences between groups before teaching. It also improved the trustworthiness of the findings by allowing comparison between groups that took pre-tests and those that did not.

Purposive sampling was used to select four secondary schools that had basic ICT facilities such as computers, projectors, and internet access. This was important to ensure that the schools could support the use of digital learning materials. The selected schools were approximately 10 kilometers apart to reduce chances of learners sharing information across groups, which could affect the results. Geography classes were randomly assigned to either experimental or control groups. In schools with more than one Geography stream, one stream was randomly selected to participate in the study. The sample size consisted of 161 Form Three Geography learners, which was considered adequate for the quasi-experimental design since it involved intact classes from selected schools. Ten percent of the sample (16 learners) was used for piloting the research instruments before the main study. The pilot study helped improve the validity, reliability, and clarity of the motivation questionnaire.

The study involved four groups: Experimental Group 1 (E1), Experimental Group 2 (E2), Control Group 1 (C1), and Control Group 2 (C2). The experimental groups (E1 and E2) were taught using low-cost digital tools such as YouTube videos and internet images. The control groups (C1 and C2) were taught using printed 2D topographical maps and teacher explanation only.

Digital technology tools were not merely used as teaching aids but as guided learning support materials designed to enhance learner motivation. The videos and images were used to capture learners' attention, increase the relevance of map work concepts, build confidence in interpreting topographical maps, and improve satisfaction with the learning process. Teachers guided learners step-by-step as they interacted with the digital resources, making learning more interesting, interactive, and meaningful.

Groups E1 and C1 were given a motivation pre-test using the Reduced Instructional Materials Motivation Survey (RIMMS), while E2 and C2 did not take the pre-test. All groups were then taught map work for three weeks using their assigned instructional methods. After the teaching period, all groups completed the same motivation questionnaire as a post-test. The use of pre-test and no pre-test groups helped to determine whether taking a pre-test influenced learners' motivational responses. This strengthened the validity of the findings by ensuring that any improvement in motivation was mainly attributable to the instructional approach rather than prior exposure to the questionnaire.

The study was carried out in secondary schools in Rongo Sub-County, Migori County, along the Kisii–Sirare Road in western Kenya. According to the 2019 Kenya Population and Housing Census, the sub-county has approximately 124,587 residents distributed across four wards. It has 199 primary schools, 39 secondary schools, three tertiary colleges, one university, and one polytechnic. The area was selected because Geography performance has remained low over the years, particularly in map work.

This setting provided an appropriate context for examining how low-cost digital technologies could enhance learners' motivation to learn map work in resource-constrained schools.

Learners' motivation was measured using an adapted version of the Reduced Instructional Materials Motivation Survey (RIMMS) developed from Keller's ARCS model of motivation. The instrument consisted of 12 items measuring four motivational dimensions: Attention, Relevance, Confidence, and Satisfaction. A five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5) was used to record learners' responses. The questionnaire was administered before and after the intervention to determine changes in learners' motivation resulting from exposure to YouTube videos and internet images during map work lessons.

Reliability of the motivation questionnaire was established using Cronbach's alpha, which yielded a coefficient of 0.91, indicating high internal consistency. Validity was ensured through face, content, and construct validation, including alignment of questionnaire items with the ARCS motivational framework. After data collection, the responses were entered into the Statistical Package for Social Sciences (SPSS) version 20 for analysis. Descriptive statistics such as means and standard deviations were used to summarize learners' motivation levels, while paired-sample t-tests and independent-sample t-tests were used to determine whether digital technology had a significant effect on learners' motivation to learn map work.

4. ETHICAL CONSIDERATIONS

Approval to conduct the study was first obtained from the University Ethics Review Committee. A research permit was obtained from the National Commission for Science, Technology and Innovation (NACOSTI). Permission was also obtained from education officers and school principals. Informed consent was obtained from all participants. Since the study involved Form Three learners, most of whom were below 18 years of age, consent was also sought from their parents or guardians. The principle of beneficence was followed to ensure that no participant was harmed in any way.

The principle of justice was also observed by treating all learners fairly. All selected learners had an equal opportunity to participate in the study regardless of gender, background, or ability.

Confidentiality and anonymity were strictly maintained, and all data collected were used solely for academic purposes.

As noted by Sarroub and Nicholas (2021), ethical concerns may arise when a teacher also serves as the researcher because learners may feel pressured to participate. To address this, the purpose of the study was clearly explained to learners, and participation was made voluntary and not linked to academic grades or examinations.

5. RESULTS AND DISCUSSION

To determine the effect of digital technology on learners' motivation in map work in secondary schools in Rongo Sub-County, Kenya, a pretest was administered to experimental (E1) and control group (C1) before the intervention. The purpose of the pretest was to establish the baseline motivation levels and ensure comparability between the groups. Learners' motivation was measured using the Reduced Instructional Materials Motivation Survey (RIMMS), which assessed four components: Attention, relevance, confidence, and satisfaction. After the intervention, a posttest was administered using the same instrument to all groups E1, E2, C1 and C2. The posttest scores were analyzed using descriptive statistics and the Independent Samples t-test to determine whether digital technology significantly influenced learners' motivation in map work. Pre- and post-test scores of the E1 students were compared using a one-way repeated measures Analysis of Variance (ANOVA) to evaluate whether the use of digital technology significantly improved learners' motivation in map work.

Reduced Instructional Materials Motivation Survey Pre-test

Table 1: Reduced Instructional Materials Motivation Survey Pre-test

RIMMS Subscale	Group	N	Mean	S.D	Std. Error Mean
Attention	E1	39	3.05	0.61	0.10
	C1	38	2.96	0.63	0.10
Relevance	E1	39	3.10	0.59	0.09
	C1	38	3.02	0.62	0.10
Confidence	E1	39	3.02	0.64	0.10
	C1	38	2.94	0.65	0.11
Satisfaction	E1	39	3.07	0.60	0.10
	C1	38	2.99	0.63	0.10

The results presented in Table 1 indicate that learners in both the experimental group (E1) and the control group (C1) exhibited comparable levels of motivation prior to the intervention across all four RIMMS components. The mean scores for attention, relevance, confidence, and satisfaction ranged between 2.94 and 3.10, indicating moderate motivation levels among learners before the introduction of digital technology.

Specifically, learners in the experimental group recorded slightly higher mean scores across the four components, with relevance showing the highest mean score ($M = 3.10$, $SD = 0.59$), followed by satisfaction ($M = 3.07$, $SD = 0.60$), attention ($M = 3.05$, $SD = 0.61$), and confidence ($M = 3.02$, $SD = 0.64$). Similarly, learners in the control group recorded mean scores of 3.02 for relevance, 2.99 for satisfaction, 2.96 for attention, and 2.94 for confidence, indicating relatively similar motivation levels.

To determine whether these observed differences were statistically significant, independent samples t-tests were conducted for each motivation component at the 0.05 level of significance.

Table 2: Independent Samples t-test for RIMMS Pretest Subscales

Subscale	T	Df	Sig. (2-tailed)
Attention	0.64	75	0.524
Relevance	0.57	75	0.571
Confidence	0.55	75	0.585
Satisfaction	0.58	75	0.563

An independent samples t-test was conducted to examine whether there were significant differences in motivation between learners in the experimental group (E1) and those in the control group (C1) prior to the intervention. The analysis was presented in table 1 that revealed that there were no statistically significant differences between the two groups across all four RIMMS subscales. Specifically, the results showed no significant difference in attention, $t(75) = 0.64, p = .524$, relevance, $t(75) = 0.57, p = .571$, confidence, $t(75) = 0.55, p = .585$, and satisfaction, $t(75) = 0.58, p = .563$. All p-values were greater than the significance level of 0.05.

These findings indicate that learners in both the experimental and control groups had similar levels of motivation before the intervention. Establishing this baseline equivalence was important because it confirms that any subsequent differences in motivation observed after the intervention can reasonably be attributed to the use of digital technology in teaching map work rather than pre-existing motivational differences among learners.

Reduced Instructional Materials Motivation Survey Posttest results

Table 3: Reduced Instructional Materials Motivation Survey (RIMMS) Posttest Results

ARCS Component	Group	N	Mean	Std. Deviation
Attention	E1	39	4.30	0.60
	E2	42	4.36	0.58
	C1	38	2.70	0.76
	C2	42	2.82	0.74
Relevance	E1	39	4.38	0.57
	E2	42	4.43	0.55
	C1	38	2.85	0.73
	C2	42	2.96	0.71
Confidence	E1	39	4.25	0.63
	E2	42	4.31	0.60
	C1	38	2.65	0.78
	C2	42	2.74	0.75
Satisfaction	E1	39	4.28	0.61
	E2	42	4.33	0.59
	C1	38	2.72	0.74
	C2	42	2.83	0.72
Overall Motivation Mean	E1	39	4.30	—
	E2	42	4.36	—
	C1	38	2.73	—
	C2	42	2.84	—

Table 3 show that learners in the experimental groups (E1 and E2) consistently recorded higher mean scores across all ARCS components compared to learners in the control groups (C1 and C2). For instance, the attention component recorded mean scores of 4.30 and 4.36 in the experimental groups, whereas the control groups recorded lower mean scores of 2.70 and 2.82. Similar patterns were observed for relevance, confidence, and satisfaction.

When the four components were combined to compute the overall motivation mean, the experimental groups maintained high levels of motivation, with E1 recording a mean of 4.30 and E2 recording 4.36, while the control groups recorded substantially lower motivation levels (C1 = 2.73 and C2 = 2.84). These results suggest that learners who were taught using digital technology demonstrated higher levels of motivation in map work lessons compared to those taught using conventional methods. However, descriptive statistics alone cannot determine whether these differences are statistically significant. Therefore, a Two-Way Analysis of Variance (ANOVA) was conducted to examine the main effect of digital technology, the effect of pretesting, and the interaction effect between treatment and pretesting on learners' motivation.

Table 4: Two-Way ANOVA Results for Posttest Motivation

Dependent Variable	Source	Df	F	Sig. (p)	Partial η^2
Attention	Treatment	1,159	128.5	<0.001	0.45
	Pretest	1,159	0.75	0.387	0.005
	Treatment $\times$ Pretest	1,159	0.32	0.572	0.002
Relevance	Treatment	1,159	135.3	<0.001	0.46
	Pretest	1,159	0.68	0.410	0.004
	Treatment $\times$ Pretest	1,159	0.28	0.598	0.002
Confidence	Treatment	1,159	126.7	<0.001	0.44
	Pretest	1,159	0.56	0.456	0.003
	Treatment $\times$ Pretest	1,159	0.35	0.554	0.002
Satisfaction	Treatment	1,159	124.9	<0.001	0.43
	Pretest	1,159	0.62	0.432	0.004
	Treatment $\times$ Pretest	1,159	0.31	0.577	0.002
Overall Motivation	Treatment	1,159	140.5	<0.001	0.47
	Pretest	1,159	0.61	0.437	0.004
	Treatment $\times$ Pretest	1,159	0.33	0.567	0.002

The Two-Way ANOVA results for posttest motivation revealed a significant main effect of treatment (Digital vs Conventional) on all ARCS subscales and overall motivation. Specifically, learners in the experimental groups, E1 and E2, achieved higher scores across all components compared to the control groups, indicating that digital technology had a strong positive impact on motivation. For Attention, E1 recorded a mean of 4.30 (SD = 0.60) and E2 a mean of 4.36 (SD = 0.58), while the control groups

scored lower, with C1 at 2.70 (SD = 0.76) and C2 at 2.82 (SD = 0.74). In terms of Relevance, E1 scored 4.38 (SD = 0.57) and E2 4.43 (SD = 0.55), compared to C1 with 2.85 (SD = 0.73) and C2 with 2.96 (SD = 0.71). For Confidence, experimental groups again outperformed controls with E1 at 4.25 (SD = 0.63) and E2 at 4.31 (SD = 0.60), whereas C1 scored 2.65 (SD = 0.78) and C2 2.74 (SD = 0.75). Satisfaction scores followed the same pattern, with E1 at 4.28 (SD = 0.61) and E2 at 4.33 (SD = 0.59), while C1 and C2 scored 2.72 (SD = 0.74) and 2.83 (SD = 0.72), respectively. The overall motivation means were 4.30 for E1, 4.36 for E2, 2.73 for C1, and 2.84 for C2.

The effect sizes, as indicated by Partial η^2 , ranged from 0.43 to 0.47, demonstrating a large and meaningful effect of digital technology on learners' motivation. The main effect of pretesting was not significant for any subscale or overall motivation, and the interaction between treatment and pretest was also non-significant. This indicates that the benefits of digital technology in enhancing attention, perceived relevance, confidence, satisfaction, and overall motivation were consistent regardless of pretest exposure. Overall, these results strongly suggest that integrating digital tools, specifically, YouTube videos and internet images, effectively increased learners' motivation to engage with map work lessons in secondary schools in Rongo Sub-County, Kenya.

These findings support Efremova and Huseynova (2021), who argue that digital tools enhance learner motivation by increasing perceived value. Yıldız (2023) further emphasizes that platforms such as YouTube stimulate enthusiasm and encourage self-directed learning. Similarly, Beardsley et al. (2021) highlight that effective digital integration fosters motivating learning environments, while Calderón, Merono, and MacPhail (2020) demonstrate that student-centered digital approaches positively influence intrinsic motivation and classroom climate.

6. LIMITATIONS OF THE STUDY

This study was done in four secondary schools in Rongo Sub-County, Kenya, so the findings may not fully apply to other areas with different school conditions, learners, and resources. The study also took a short period of three weeks, which may not show the long-term effects of using digital technology in teaching map work. Future studies should use a longer period of teaching to find out the long-term effects of digital technology on learning. Researchers can also include other digital tools such as GIS, simulations, and mobile applications to compare their effectiveness.

Despite these limitations, this study is important because it shows that simple and low-cost digital tools like YouTube videos and internet images can improve learners' performance in map work. This is useful especially in schools with limited digital technology tools resources. The study also gives practical ideas to teachers on how to teach difficult map work topics such as contour interpretation and landform visualization using digital support. It further helps school leaders and policymakers understand that effective digital learning does not always require expensive technology.

7. CONCLUSION

From data collected in this study's quasi-experiment and the empirical evidence provided by the subsequent statistical data analyses, it is concluded that the use of digital technology in teaching map work significantly improves learners' motivation when compared to the use of conventional instructional approaches. It is recommended that Geography teachers integrate accessible digital technologies such as YouTube videos and internet images into the teaching of topographical map work to improve learners' motivation to learn map work. School administrators should support the integration of digital technology. The Ministry of Education and curriculum developers should promote the use of digital instructional resources in the teaching of map work. Teacher training institutions and professional development programmes should equip Geography teachers with the knowledge and skills required to effectively integrate digital technologies into classroom instruction, particularly in the teaching of abstract concepts such as topographical map work. Since the study established that digital technology improves learners' motivation to learn map work, schools should encourage learner-centred instructional approaches that utilize digital resources to promote active learning, knowledge construction, and the development of spatial thinking skills.

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