EFFECT OF ICT INTEGRATION IN ENHANCING STORY GRAMMAR ACHIEVEMENT AMONG SECONDARY SCHOOL LEARNERS WITH HEARING IMPAIRMENT IN SELECTED COUNTIES, KENYA

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Abstract:

Using a quasi-experimental research design merged with a descriptive survey design; the researcher examined the effect of ICT integration in enhancing story grammar achievement among secondary school learners with hearing impairment in the counties of Tharaka Nithi and Embu in Kenya. This study was guided by the Technological Pedagogical Content Knowledge (TPACK) theory. Purposively, a secondary school for learners with HI was picked from each county. All learners (40), 2 teachers teaching English and the principals from the two sampled schools were used as the sample size. Learners were presented with a Students Story Grammar Achievement Test (SSGAT) for pre- and post-test. Further, questionnaires were used to gather more data from both the learners and the English teachers, while principals were engaged in an open-ended interview. The study findings revealed that ICT integration enhances story grammar achievement (t = 2.415, p = 0.0180) among secondary school learners with hearing impairment. The researcher suggests monitoring the 2021 ICT policy on education and training implementation, educating teacher trainees on technology integration, reviewing school strategic plans, and digitalizing story grammar resources for learners with HI.

Keywords: achievement in story grammar, ICT Integration, hearing impairment, traditional instructional pedagogies

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1. Introduction

Information and communication technology, a crucial aspect of the twenty-first century, significantly impacts practically every aspect of life (Gnambs, 2021). Similarly, ICT has also changed the education sector, making learning activities more engaging and productive (Lin *et al.*, 2017). Technology has allowed for this change by providing various tools that may be used to create more proactive learning environments in the classroom (Jogezai *et al.*, 2021). ICT-integrated instructional methods not only improve the quality of instruction (Akram *et al.*, 2021a), but they also help students increase their motivation, intra- and interpersonal skills, and knowledge of the world (Chen *et al.*, 2018). The demands of today's learners necessitate continued emphasis on technological integration (DeCoito *et al.*, 2022).

Rosnaini and Mohd (2008) define ICT integration in education as the process of deciding how and where technology fits best in teaching and learning. They contend that this process has become a major area of concern for educational institutions worldwide. Gilakjani (2017) defines information and communication technology integration as the art and practice of successfully integrating technology into the classroom to meet learning and teaching outcomes.

Governments and legislators have long maintained that one of the most important 21st-century skills is employing ICT in the classroom. UNESCO 2003 views information and communications technology as one of the most valuable and promising tools for increasing educational opportunities, and it can offer a proactive and dynamic learning and teaching environment (Arnseth & Hatlevik, 2010). The need of the global labour market in the twenty-first century for digitally savvy human resources forces educational institutions to completely integrate ICT into their teaching and learning processes. Research has shown that information transmitted via ICT tools affects official and informal education (UNESCO, 2015). The link between instructional practices and knowledge has been virtually entirely revolutionised by computers (Oulmaati *et al.*, 2017). In addition to its effects on education, ICT is crucial for fostering dialogue among resource persons, experts, mentors, professionals, researchers, peers, and business leaders globally (Asongu & LeRoux, 2017).

According to research on ICT use in education, adopting ICT helps students understand what they are learning. This is especially true when ICT is used as a tool for knowledge production, a setting for learning by doing, and a way to promote cognitive development (Khine, 2006). Further research indicates that ICT is also utilised in social settings as a tool to facilitate cooperative learning and as a thought partner to help students articulate their knowledge and how it was gained (Khine, 2006).

According to Abbasi *et al.* (2021), instructors must acknowledge the importance of ICT integration in learning environments due to changes in the approaches used in modern education. Similar to how the quick development of ICTs has made students digital learners, Akram *et al.* (2022) note that teachers must incorporate ICT into their pedagogical approaches; their technological know-how, attitudes, and abilities are

essential for this integration to be successful. According to Pultoo *et al.* (2020), teachers' acceptance of integrating technology into the classroom and their employment of innovative methods to instill 21st-century skills are crucial to ensuring the successful adoption of technology integration in learning environments. Applying traditional teaching techniques primarily defined learning settings before the twenty-first century. On the other hand, ICT integration in education is progressively replacing these teaching approaches in the twenty-first century. This change in education will equip students to live and work in a "knowledge society." The aforementioned realisation is the reason why various nations have embraced the integration of ICT in learning and teaching, according to UNESCO (2013), which states that governments everywhere are working to ensure that their inhabitants have access to high-quality education. In order to give students the skills they need for life in the modern world and beyond, governments everywhere have invested in and continue to invest in ICT integration at all educational levels (Wambiri & Ndani, 2017). In countries like South Korea, whose economy has grown significantly since the 1970s, it is believed that this integration and large investment in educational technology have had a positive impact (Sanchez *et al.*, 2011). Despite the lack of sufficient empirical data addressing the outcomes of such programmes, developing countries have increased their spending on ICTs for schools (Piper *et al.*, 2015). Nevertheless, three of Sub-Saharan Africa's top innovation hubs are listed as Kenya, South Africa, and Mauritius in the World Intellectual Property Organization's 2019 Global Innovation Index (GII) report. Despite the government's readiness to support the endeavour, integrating ICT into learning and teaching is difficult in many developing nations (Kombo, 2013). Nonetheless, several of these nations have made investments in ICT integration for teaching and learning, both financially and through the creation of new policies. Like many other nations, Kenya has incorporated ICT into its educational programmes over time (Mariga *et al.*, 2017; Muinde & Mbataru, 2019).

ICT allowed continuous learning to continue during the COVID-19 epidemic because of its capacity to transcend geography and time (Tarus, 2015). According to UNICEF data, about 20 million students missed school during the pandemic period. Educators resorted to remote learning to ensure that students continued their education (Brown & Otieno, 2020). The importance of ICT in sustaining learning and teaching activities for the millions of students who were not enrolled in school during the COVID-19 global period, when restrictions were imposed on activities in all spheres of human life worldwide, has also been highlighted by Thaheem *et al.* (2021).

The majority of hearing-impaired pupils leave secondary school at a period when their comprehension of English phrases is relatively low (Maina *et al.*, 2014). This is demonstrated by their consistently poor performance in the Kenya Certificate of Secondary Examination (KCSE) English paper.

Maina *et al.* (2014) state that the majority of secondary school graduates who have hearing problems do so at a time when their understanding of English phrases is quite limited. This is demonstrated by their consistently poor performance in the Kenya Certificate of Secondary Examination (KCSE) English scores. Story grammar accounts for

65 (32.5%) of the 200 possible marks in the KCSE English paper. Consequently, it is the only English area with the highest percentage of points. Additional points are distributed among several sections of the English curriculum. These subjects also depend on the students' understanding of story grammar since story grammar, sometimes referred to as narrative structure, is the analysis of a tale's internal structure to identify its basic formal components and elements as well as their relationships (Lalas, 1983). Characters, storylines, settings, themes, and style are some of these components. Dymock's (2007) view on story grammar is that it aids readers in understanding the fundamental elements of a story and their interconnectedness to form a cohesive whole. Learning story grammar has proven extremely difficult for students with hearing impairments because it requires a significant deal of reading interest and extensive teacher explanations. Since it is well known that people with hearing impairments have trouble communicating, the only way to pique and maintain their interest in reading is to use learner-centered teaching strategies that involve students at all levels and stimulate all of their senses—particularly sight for the deaf and that of hearing for the hard of hearing. According to Mbodila and Kikunga (2012), scholars generally agree that incorporating ICT into pedagogy improves learning outcomes and is essential in preparing hearing-impaired students for the challenges of globalisation in the twenty-first century. With the use of ICT, learners with hearing loss can participate in higher-order thinking that they can then apply to solve problems in everyday life. Thus, information and communication technology (ICT) develops human capital, leading to technological advancements and economic prosperity.

Knowing story grammar is not just necessary for English classes, but it is also a helpful ability for any other subject where English is the primary language of instruction. Chege (2012) discovered a positive correlation between story grammar comprehension and success in other English-language courses. This suggests that secondary school students with hearing impairments do significantly better overall when they understand story grammar. Students with hearing loss appear to be significantly disadvantaged by the continuous use of traditional teaching strategies that primarily rely on aural input, and this may partially account for these students' persistently poor performance in English and other courses. According to data from the KNEC (2018–2022), students with hearing impairments have consistently performed poorly on the national exam in English throughout the years, with most schools reporting average grades of D– (minus) for the last five years.

2. Statement of the Problem

Even though there are schools for the deaf with certified English teachers, English performance has been appalling over time, as earlier stated. The continued application of traditional instructional strategies could partially explain this. The Kenyan government launched the Digital Literacy Programme in 2013 with the goal of incorporating technology into instruction. The Basic Education Act, No. 14, which was amended in

2014, included several important concepts and ideals, among them the encouragement of technology transfer, originality, creativity, and inventiveness.

Even though there is an ICT policy that supports the use of ICT in L/T, and the government and other organisations have attempted to provide ICT equipment to some schools for learners with HI, the majority of these devices are gathering dust in the office or resource rooms, and in the rare instances that they are put to use, they are employed for functions other than integration in L/T, like accounting and entertainment. Thus, this research was necessary to test the integration of ICT in enhancing story grammar achievement among secondary school students with HI.

2.1 Purpose

This study aimed to determine the impact of ICT integration on story grammar achievement among secondary school students with hearing impairment in the Kenyan counties of Tharaka Nithi and Embu. The key questions guiding this study were: Do secondary schools for learners with HI in the selected counties have ICT infrastructure for use in L/T? Does integrating ICT in learning and teaching story grammar among secondary school learners with HI help improve their performance in this area? Does it help them understand Story Grammar concepts better? Does it motivate learners with HI to learn story grammar?

2.2 Research Hypotheses

The researcher formulated one central study hypothesis as follows;
Ho1: In the sampled schools, there was no statistically significant difference in story grammar achievement among hearing-impaired secondary school students before and after ICT integration.

2.3 Theoretical Framework

The TPACK theory by Mishra and Kohler (2006) was used in this research. Above all, TPACK theory assists educators in identifying essential components that can be included in instruction: technology, pedagogy, and content. Guoyan *et al.* (2021) assert that instructors' self-efficacy is a crucial element of successful ICT integration in the classroom. This is only possible if educators have received sufficient training and experience to provide them with a strong basis in content, pedagogical, and technological knowledge. According to Khan *et al.* (2021), the paradigm change during the COVID-19 phase from in-person instruction to online learning was advantageous for teachers and students as it enhanced the acquisition of technological skills through various digital platforms and tools.

Second, the TPACK model is helpful as a general model for lesson preparation since it connects pedagogy, content, and technology. The idea is made even more advantageous by considering context, which can help use technology in teaching and learning. Aslam *et al.* (2021) found that integrating ICT enhances the calibre of the teaching and learning process. They also found a strong correlation between teachers'

technology integration competencies and their technical pedagogical and content knowledge (TPACK).

3. Method

Due to the need for data complementarity that requires methodological plurality in education research (Loeb *et al.*, 2017), this study used a mixed methods approach in which a quasi-experimental design (QED) was paired with a descriptive survey design to gather detailed data that would help address the key questions. The pre-test, treatment, and post-test were administered to every subject by the researcher under QED. In QEDs, all individuals act as their own controls, an aspect that was used in this research, unlike in an actual experiment where a particular group acts as the control group.

3.1 Setting

This study conducted a quasi-experiment among 40 secondary school learners with hearing impairment in the two selected schools. School A had 14 learners, while school B had 26 learners. The learners were presented with SSGAT before integration and after integration. Treatment (integrating ICT in teaching and learning) was conducted for 10 weeks, three forty-minute lessons every week, totalling 30 lessons (20 hours of experiment). Such a period was deemed sufficient for the experiment. For detailed data, a questionnaire was further used to collect descriptive data from the identical learners and 2 teachers teaching them English. More data was gathered from the two school principals through interviews.

3.2 Participants

The participants in this research were 40 from four learners with hearing impairment, 2 teachers teaching English among these learners, and the two principals of the selected schools.

Table 1: Demographic Information

School	Target population	Sample size	Percentage (%)
A	14 learners	14 learners	100
	1 principal	1 principal	100
	1 teacher of English	1 teacher of English	100
B	26 learners	26 learners	100
	1 principal	1 principal	100
	1 teacher of English	1 teacher of English	100
Grand total		**40 learners**	**100**
		2 principals	**100**
		2 teacher of English	**100**

This made a total of 44 participants. Whole-group sampling is advised by Ary *et al.* (2014) in situations where the population is limited, which is why the research examined every

learner—a crucial risk factor for QEDs—thus helping reduce selection bias. This demographic information has been provided in Table 1.

4. Results and Discussions

4.1 Effect of ICT Integration on Story Grammar Achievement

The study aimed to determine whether integrating ICT may improve story grammar achievement among HI high school students in the designated counties. In order to do this, the researcher ran a treatment that included leveraging ICT to engage the students during story grammar lessons. The study employed a ten-week treatment regimen consisting of three forty-minute lessons per week. After the treatment, the researcher wanted to know how ICT integration in L/T, as a treatment, affected achievement in story grammar among secondary school students with hearing impairment in the chosen counties. To evaluate this, the same test (SSGAT) that was given during the pre-test was also given. The post-test results for learners' story grammar were examined, summarised, clarified, interpreted, and debated according to the learners' age, gender, and school.

4.1.1 Post-Test Results for Learners' Story Grammar by School

Twenty-six students from school B and fourteen from school A with hearing impairments participated in the post-test. The learners' post-test results from the two schools are shown in Table 2 as follows.

Table 2: Distribution of Story Grammar Post-Test Scores by School

| School	Lowest score	Highest score	Mean	Standard deviation
A	1	16	8.36	5.06
B	1	20	9.08	4.93

After receiving therapy (ICT integration), School A had a post-test mean of 8.36 with a standard deviation of 5.06. On the other hand, school B received a post-test mean score of 9.08 with a standard deviation of 4.93. The highest post-test score was 16 in school A and 20 in school B, while the lowest score in both schools was 1 out of a possible 25.

### 4.2 Distribution of Post-Test Results by Number of Learners in the Schools

The distribution of learners' post-test scores in schools A and B was further examined in the study, and the results are shown in Figures 1 and 2.

According to the post-test results shown in Figures 1 and 2, 23.1% (3) of students in School A and 22.9% (6) in School B scored higher than half of the possible total score after ICT integration. After integrating ICT into teaching and learning, we would estimate that about a quarter (22.5%) of secondary school students with HI in the target schools achieved above half (12.5) of the potential total score (25) in story grammar.

Figure 1: Distribution of Learners' Post-test Results in School A
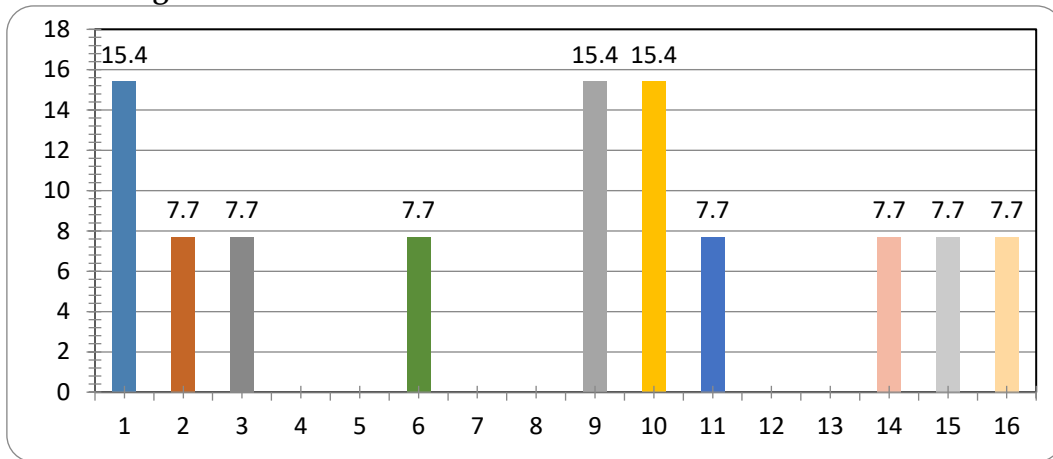
Figure 2: Distribution of Learners' Post-Test Scores in School B
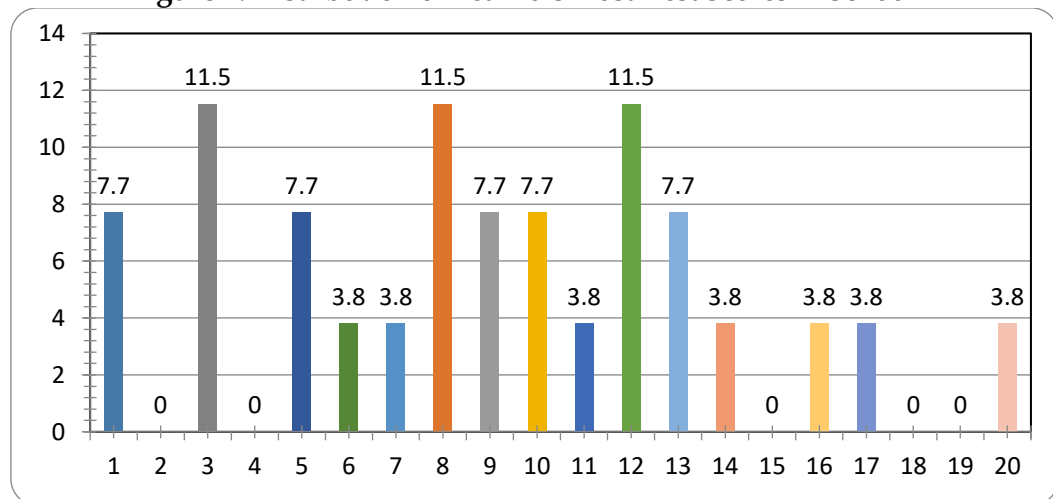
4.4 Impact of ICT Integration on Learners with HI's Story Grammar Achievement

In order to accomplish the goal of the study, the post-test findings were compared with the pre-test results to ascertain whether or not the given treatment impacted story grammar achievement. Initially, this comparison was conducted for each specific school and was done generally.

4.4.1 ICT Integration's Impact on School A's Scores

The story grammar results for   A were compared before and after the test using a two-sample t-test. The results are shown in Table 3.

Table 3: Impact of ICT Integration on School A Learners' Story Grammar Scores

```
Two-sample t test with equal variances

Variable  |     Obs       Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]

SchAfter  |      14   8.357143   1.353088    5.062793    5.433973    11.28031
 schApre  |      14   4.357143    .715658    2.677747    2.811058    5.903228

combined  |      28   6.357143   .8439236    4.465624    4.625555    8.088731

    diff  |               4   1.530691                   .8536201     7.14638

   diff = mean(SchAfter) - mean(schApre)                       t =    2.6132
Ho: diff = 0                                   degrees of freedom =       26

   Ha: diff < 0                   Ha: diff != 0                  Ha: diff > 0
 Pr(T < t) = 0.9926        Pr(|T| > |t|) = 0.0147         Pr(T > t) = 0.0074
```

ICT integration has a statistically significant effect on students' story grammar achievement in school A (t = 2.61, p = 0.0147).

4.4.2 Impact of ICT Integration on School B's Scores

Similarly, the effect of ICT integration on students' story grammar scores in school B was evaluated using a two-sample t-test. Table 4 presents the findings.

Table 4: Impact of ICT Integration on School B Learners' Story Grammar Scores

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Two-sample t test with equal variances

Variable  |     Obs       Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]

SchBaf~r  |      26   9.076923   .9670305    4.930907    7.085287    11.06856
 schBpre  |      26   7.346154   .9477785    4.832741    5.394168     9.29814

combined  |      52   8.211538   .6812156    4.912316    6.843941    9.579136

    diff  |          1.730769   1.354043               -.9889058    4.450444

   diff = mean(SchBafter) - mean(schBpre)                      t =    1.2782
Ho: diff = 0                                   degrees of freedom =       50

   Ha: diff < 0                   Ha: diff != 0                  Ha: diff > 0
 Pr(T < t) = 0.8965        Pr(|T| > |t|) = 0.2071         Pr(T > t) = 0.1035
```

The results show a statistically significant difference between the pre- and post-test scores (t = 1.278, P = 0.207). This showed that story grammar achievement among

students with hearing impairments in school B was improved by ICT integration, although not in a statistically significant way. This could be explained by the fact that school B was found to be practicing ICT integration, although not fully. During the pretest, school B posted higher results as compared to school A due to the said advantage.

4.5 Overall Impact of ICT Integration on Improving Students' Story Grammar Performance in Schools

To determine the overall impact of ICT integration on improving story grammar achievement among HI secondary school students, a score comparison between the pre- and post-integration periods was applied. Table 5 presents the obtained results.

Table 5: Overall Impact of ICT Integration on Students' Performance

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Two-sample t test with equal variances

Variable      Obs       Mean    Std. Err.    Std. Dev.    [95% Conf. Interval]

SchooA~r       40      8.825    .7786309     4.924494      7.25007    10.39993
school~e       40        6.3    .6972473     4.409779     4.889684    7.710316

combined       80     7.5625    .538353      4.815176     6.490935    8.634065

    diff              2.525    1.045189                  .4441887    4.605811

    diff = mean(SchooAfter) - mean(schoolpre)                      t =    2.4158
Ho: diff = 0                                     degrees of freedom =        78

    Ha: diff < 0                Ha: diff != 0                  Ha: diff > 0
 Pr(T < t) = 0.9910        Pr(|T| > |t|) = 0.0180         Pr(T > t) = 0.0090
```

The findings, shown in Table 5 above, show that there was a statistically significant difference in the two sampled schools' story grammar scores (t = 2.415, p = 0.0180). Thus, this study may assert that the use of ICT in the teaching and learning of story grammar among students with hearing loss in the sampled schools enhances their achievement in the subject.

These results are consistent with several earlier findings that showed enhanced comprehension and performance across several subject areas due to incorporating ICT in their learning and teaching. For instance, Muhammad's 2016 study's findings showed that students who learned English writing techniques using CAI software fared better than those who learned the same techniques the conventional way. Similarly, a 2015 UNESCO report asserts that ICT technologies can improve educational standards in various ways, including by increasing learner motivation and engagement and simplifying the acquisition of foundational skills. Furthermore, Pultoo *et al.* (2020) assert that ICT acts as a catalyst by providing a variety of ways to foster engagement and communication between educators and students. Teachers can design lessons using guided exploration, simulation, manipulation, mind mapping, and creative expression to

assist students improve their knowledge and problem-solving abilities with the aid of ICT (Eickelmann & Vennemann, 2017).

According to studies conducted in 2016 by Muli and Manna, students who received computer-assisted education for English writing abilities did better than their peers in the control group who got the same instruction using traditional teaching methods. Information and communications technology also enhanced learning outcomes by raising student engagement with the subject matter and creating a more interactive learning environment (Mwatsaka, 2020).

Therefore, the results of this study do not stand alone or contradict the vast majority of other earlier studies in the field. The present investigation has introduced two novel learning domains—secondary school children with hearing loss and story grammar—that were not explored in earlier research. The results of this study confirm that students with HI should not be excluded from using technology to learn because of the disorder. The results have shown that when ICT is included in their education, students' achievement improves at the same rate as that of their hearing counterparts. This is notably true in English, where these students have historically performed poorly. ICT may be helpful for teaching and learning across all student categories if it is handled properly, as mentioned by Hue and Ab Jalil (2013).

5. Hypothesis Testing

There was only one hypothesis for this study:

Ho1: Before and after ICT integration in the schools under study, there was no statistically significant difference in the story grammar achievement of secondary school students with hearing loss.

The integration of ICT led to a statistically significant variance in the scores, according to the overall results of a two-sample t-test used to assess the learners' pre- and post-test scores (t = 2.415, p = 0.0180). Scores were lower prior to and during ICT integration. As a result, the current study's null hypothesis was rejected.

Muhammad (2016) discovered in his research that students who learned English writing skills using computer-assisted instruction software performed better than those who used conventional teaching methods. Similarly, Hooley and Thorpe's 2017 study found that students who received instruction using CBI did better than those who received instruction using outmoded methods for the same subject. The results of Mwiluli (2018) and Abobo (2019), who both concluded that ICT integration improves academic attainment in various learning domains, corroborate the current study's findings.

Furthermore, Liu S. *et al.* (2021) found that incorporating ICT into teaching and learning procedures enables students to keep in touch with their teachers and peers. Similar findings have already been published by Tarus (2015), who indicated that Students can collaborate on assignments with stakeholders both inside and outside of a classroom environment by using ICT tools to present their work to an external audience.

6. Conclusions

This study aimed to investigate how using ICT can help secondary school students with hearing impairments in the Kenyan counties of Tharaka Nithi and Embu do better in story grammar. Following a successful quasi-experiment, results showed that using ICT to teach and learn story grammar to these learners improved their performance in the area, as seen by the statistically significant difference between test results from the post and the pre-test.

Therefore, this study may conclude that ICT integration improves story grammar achievement among secondary school students with hearing impairment in the chosen counties. This can be accounted for by ICT integration, which allows students with hearing loss to engage with the course material more visually than auditorily.

6.1 Recommendations
6.1.1 Recommendation for Research

Although the focus of this study was story grammar, further research is still needed in other English-related fields, including grammar, writing, oral literature, and other aspects of English among secondary school learners with HI also, while the focus of this study was on children with hearing impairments, other categories of students with special needs also exist. As a result, studies comparable to this one might be conducted on students in other categories, such as those with Autism Spectrum Disorder and visual impairments, among other categories.

6.1.2 Recommendation for Practice

The researcher recommends that teachers of learners with hearing impairment align their pedagogical practices with the 21st-century skill demands. Their strategies should shift from conventional methods to ICT application and integration in learning and teaching.

6.1.3 Recommendation for Policy

The study suggests that story grammar tools be converted to digital format for students with hearing impairments. These students now face difficulties reading and comprehending texts designed primarily for hearing learners. To make this feasible, these students must rely on the assistance of sign language interpreters, some of whom simply translate the text without taking into account the dynamics of the story's grammatical context.

Conflict of Interest Statement
The authors declare no conflicts of interest.

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References

Abbasi, W. T., Ibrahim, A. H., and Ali, F. B. (2021). "Perceptions About English as Second Language Teachers' Technology Based English Language Teaching in Pakistan: Attitudes, Uses of Technology and Challenges," in *International Conference on Emerging Technologies and Intelligent Systems*, (Cham: Springer), 314–325. doi: 10.1007/978-3-030-82616-1_28

Abobo, F. (2019). Computer-Aided Instruction and Performance in Kiswahili Language Skills among Public Secondary Schools in Nakuru County, Kenya. (Doctorate theses, Kenyatta University) https://ir-library.ku.ac.ke.

Akram H., Abdelrady; A.H., Al-Adwan A.S. and Ramzan M. (2022). Teachers' Perceptions of Technology Integration in Teaching-Learning Practices: A Systematic Review. *Front. Psychol. 13*:920317. doi: 10.3389/fpsyg.2022.920317

Akram, H., Yingxiu, Y., Al-Adwan, A. S., and Alkhalifah, A. (2021a). Technology integration in higher education during COVID-19: an assessment of online teaching competencies through technological pedagogical content knowledge model. *Front. Psychol.* 12:736522. doi: 10.3389/fpsyg.2021.736522

Arnseth, H. C., & Hatlevik, O. E. (2010). *Challenges in aligning pedagogical practices and pupils' competencies with the Information Society's demands: The case of Norway. In S.*

Mukerji & P. Tripathi (Eds.), Cases on technological adaptability and transnational learning: Issues and challenges. Hershey: IGI Global.

Ary, D., Jacobs, C., L., I., Sorensen., K., C., Walker, D., (2014). *Introduction to Research in Education*. Cengage Learning 1285499735, 9781285499734

Aslam, R., Khan, N., Asad, M. M., and Ahmed, U. (2021). Impact of technological pedagogical content knowledge on teachers' digital proficiency at a classroom in higher education institution of Pakistan. *Inter. Tech. Smart Edu.* 18, 119–130. [doi: 10.1108/ITSE-11-2020-0222](doi:10.1108/ITSE-11-2020-0222)

Asongu, S. A., & Le Roux, S. (2017). Enhancing ICT for inclusive human development in Sub-Saharan Africa. *Technological Forecasting and Social Change*, *118*, 44-54.

Brown, A., & Otieno, B. (2020, May 7). *Learning from home in Kibera during COVID-19. UNICEF* Kenya. [https://www.unicef.org/kenya/stories/Learning-from-home-in-Kibera-during-COVID- 19](https://www.unicef.org/kenya/stories/Learning-from-home-in-Kibera-during-COVID-19)

Chege, E. W. (2012). Reading comprehension and its relationship with academic performance among standard eight pupils in Machakos. Kenyatta University. Retrieved May 29, 2022, from http://irlibrary.ku.ac.ke/etd/handle/123456789/3722

Chen, S. Y., Hung, C. Y., Chang, Y. C., Lin, Y. S., and Lai, Y. H. (2018). "A study on integrating augmented reality technology and game-based learning model to improve motivation and effectiveness of learning English vocabulary," in *2018 1st International Cognitive Cities Conference (IC3)*, (Piscataway: IEEE), 24–27. [doi: 10.1109/IC3.2018.00015](doi:10.1109/IC3.2018.00015)

DeCoito, I., & Estaiteyeh, M. (2022). Transitioning to online teaching during the COVID-19 pandemic: An exploration of STEM teachers' views, successes, and challenges. *Journal of Science Education and Technology, 31*(3), 340–356.

Dymock, S. (2007). Comprehension Strategy Instruction: Teaching Narrative Text Structure Awareness. *The Reading Teacher, 61*(2), 161-167

Eickelmann, B. & Venneman, M. (2017). Teachers' attitudes and beliefs regarding ICT in teaching and learning in European countries. *European Educational Research Journal*, 16(6), 733-761. doi: 10.1177/1474904117725899

Gilakjani, A. P. (2017). A Review of the Literature on the Integration of Technology into the Teaching and Learning of English Language Skills. *International Journal of English Linguistics*, 7(5), 95-106.

Gnambs, T. (2021). The development of gender differences in information and communication technology (ICT) literacy in middle adolescence. *Computers in Human Behavior, 114,* Article 106533. https://doi.org/10.1016/j.chb.2020.106533

Guoyan, S., Khaskheli, A., Raza, S. A., Khan, K. A., and Hakim, F. (2021). Teachers' self-efficacy, mental well-being and continuance commitment of using learning management system during COVID-19 pandemic: a comparative study of Pakistan and Malaysia. *Inter. Learn. Env.* 2021, 1–23. [doi:10.1080/10494820. 2021.1978503](doi:10.1080/10494820.2021.1978503)

Hooley, D., S. & Thorpe, J. (2017). *The Effects of Formative Reading Assessments closely linked to Classroom Texts on High School Reading Comprehension*. Education Tech Research Dev. Research Article. doi: 10.1007/serial 11, 423-017-9514-5.

Hue, L.T., Ab Jalil, H. (2013). Attitudes towards ICT Integration into Curriculum and Usage among University Lecturers in Vietnam. International Journal of Instruction, 6(2), 53-66.

Jogezai, N. A., Baloch, F. A., Jaffar, M., Shah, T., Khilji, G. K., & Bashir, S. (2021). Teachers' attitudes toward social media (SM) use in online learning amid the COVID-19 pandemic: The effects of SM use by teachers and religious scholars during physical distancing. *Heliyon, 7*(4). https://doi.org/10.1016/j.heliyon.2021. e06781

Kenya National Examinations Council (KNEC), 2022. The years 2018-2022 Kenya Certificate of Secondary Education Examination Reports. Nairobi, Kenya: KNEC.

Khan, Z. H., and Abid, M. I. (2021). Distance learning in engineering education: Challenges and opportunities during COVID-19 pandemic crisis in Pakistan. *Int. J. Elect. Eng. Edu.* 2021:988493. doi: 10.1177/0020720920988493

Khine, M. S. (2006). *Teaching with technology: Strategies for engaging learners*. London: Pearson Prentice Hall.

Koehler, M. J., Mishra, P., & Yahya, K. (2006, April). *Content, pedagogy, and technology: Testing a model of technology integration. Paper presented at the annual meeting of the American Educational Research Association,* April 2004, San Diego, CA.

Kombo, D. (2013). *Proposal and thesis writing: An introduction*. Nairobi: Pauline's Publications Africa.

Lalas, J. W. (1983). Story Grammar Application in ESL Reading. *TESL Reporter, 16*(4).

Lin, C. Z., Zhang, Y., & Zheng, B. (2017). The roles of learning strategies and motivation in online learning: A structural equation modeling analysis. Computers & Education, 113, 75-85.

Liu, S., Kang, L., Liu, Z., Fang, J., Yang, Z., Sun, J., *et al.* (2021). Computer-supported collaborative concept mapping: the impact of students' perceptions of collaboration on their knowledge understanding and behavioral patterns. *Inter. Lear. Env. 2021, 1-20.* doi: 10.1080/10494820.2021.1927115

Loeb, S., Dynarski, S., McFarland, D., Morris, P., Reardon, S., & Reber, S. (2017). *Descriptive analysis in education: A guide for researchers* (No. NCEE 2017-4023; p. 53). U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance.

Maina. E. N., Kochung E. J. and Oketch O. (2014). *Learning Strategies Used by Deaf Students in English Reading Comprehension in Secondary Schools for the Deaf in Kenya: Implications on Academic Achievement.* Educ. Res. 5(4):122. 130

Mariga, G., Ogenga, S., Shikali, C., & Muliaro, J. (2017). Computer laptop project strategy for basic education schools in Kenya. *International Journal of Information and Communication Technology Research, 7*(5). http://repository.seku.ac.ke/handle/ 12345 6789/ 3541

Mbodila, M. & Kikunga, M. (2012). *The Use of ICT in Education. A Comparison of Traditional Pedagogy and Emerging Pedagogy Enabled by ICTs.* Proceedings of the 11th International Conference on Frontier in Education

Muhammad, A., M. (2016). The Effects of Using Web-Quests on Improving Seventh-Grade Female Students' Writing Skills in Southern AL-Mazar. Directorate of Education. *Journal of Education and Social Policy 3*(1).

Muinde, S. M., & Mbataru, P. (2019). Determinants of implementation of public sector projects in Kenya: a case of laptop project in public primary schools in Kangundo Sub-County, Machakos County. *International Academic Journal of Law and Society, 1*(2), 328–352.

Muli, G & Manna, O. (2016). The Impact of Blended Learning in Developing Students' Writing Skills: Hawassa University in Focus. *African Educational Research Journal, 4 (2),* 49-68.

Mwatsaka. M. A. (2020). Use of information, communication and technology in promoting learning for learners with hearing impairment in special schools in Mombasa County, Kenya. Unpublished thesis

Mwiluli, P.M., (2018). Influence of ICT Integration on Academic Performance in Public Secondary Schools in Kenya. A Case of Makueni County. Unpublished Master thesis: University of Nairobi.

Oulmaati, K., Ezzahri, S., & Samadi, K. (2017). The Use of ICT in the learning process among the students of History and Civilization at Abdel Malek Essaadi University, Morocco. *International Journal of Scientific Research & Engineering Technology* (IJSET), 8(2), 972979.

Piper, B., Jepkemei, E., Kwayumba, D., & Kibukho, K. (2015). Kenya's ICT Policy in Practice: The Effectiveness of Tablets and Ereaders in Improving Student Outcomes. *FIRE: Forum for International Research in Education, 2*(1). http://dx.doi.org/10.18275/ fire201502011025

Pultoo, A., Bullee, A., Meunier, J. N., Sheoraj, K., Panchoo, S., Naseeven, P., Ujoodha, M., Roocha, V., Rajcoomar, H. & Oojorah, A. (2020). CLASSE21: Educators' acceptance of technology-enhanced classroom using the UTUAUT model. *Journal of Education and Social Sciences, 14*(1), 39-48.

Rosnaini Mahmud & Mohd Arif. Hj. Ismail (2008). Factors influencing ICT integration in the classroom: Implication to teacher education. *EABR & TLC Conference Proceeding*. Austria.

Sanchez, J., Salinas, A., & Harris, J. (2011). Education with ICT in South Korea and Chile. *International Journal of Education Development, 31*, 126–146. https://doi.org/10. 1016/j.ijedu dev. 2010. 03. 003

Tarus, J. K., Gichoya, D., & Muumbo, A. (2015). Challenges of Implementing E-Learning in Kenya: A Case of Kenyan Public Universities Challenges of Implementing E-Learning in Kenya: A Case of Kenyan Public Universities. *International Review of Research in Open and Distance Learning, 16*(1), 1–10. https://doi.org/10.19173/irrodl.v16i1.1816

Tarus, J. K., Gichoya, D., & Muumbo, A. (2015). Challenges of Implementing E-Learning in Kenya: A Case of Kenyan Public Universities Challenges of Implementing E-Learning in Kenya: A Case of Kenyan Public Universities. *International Review of Research in Open and Distance Learning*, *16*(1), 1–10. https://doi.org/10.19173/irrodl.v16i1.1816

Thaheem, S. K., Abidin, M. J. Z., Mirza, Q., & Pathan, H. U. (2021). Online teaching benefits and challenges during pandemic COVID-19: a comparative study of Pakistan and Indonesia. *Asian Edu. Devel. Stud*. 11, 311–323. doi: 10.1108/AEDS-08-2020-0189

UNESCO. (2013). *Integrating ICTs in Education, Lessons learned.* Published by the UNESCO Asia and Pacific Regional Bureau for Education.

UNESCO. (2015). ICT in Education in Sub-Saharan Africa, A comparative analysis of basic e-readiness in schools, (25). Retrieved 30th August 2015, from http://uis.unesco.org/sites/default/files/documents/informationand-communication-technology-ict-in-education-in-sub-saharan-africa-2015-en.pdf

Wambiri, G., & Ndani, M. N. (2017). Kenya primary school teachers' preparation in ICT teaching: teacher beliefs, attitudes, self-efficacy, computer competence, and age. *African Journal of Teacher Education, 5*(1), 1–16. https://doi.org/10. 21083/ajote. v5i1. 3515