Original Research Article

Effect of the interactive approach on learners’ achievement in reading comprehension in Vihiga County, Kenya: A focus on learner-generated questions

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'Learner-generated questions' is a component of the interactive to approach instruction, which enables learners to comprehend passages by posing relevant questions before, during or after reading, and seeking answers to such questions. In Vihiga County, learners’ sub-optimal achievement in comprehension is a key issue that contributes to the lowest performance in English language examinations in the region. Even though the linkage between interactive approach instruction and learners’ academic performance has charmed education researchers across the globe, very few of such studies have targeted Vihiga County; while fewer have delved into the connection between learners’ questioning skills and achievement in reading comprehension. The resultant information gap for policy and programming decisions remains an issue of concern to stakeholders. In response to the situation, the Solomon Four non-equivalent-Group Design was applied to guide the study, while primary data were sourced from 279 learners and 8 teachers. Linear regression analysis generated two models, one for the experimental group (Model 1) and one for the control group (Model 2). In both models, the effect of learner-generated questions on achievement in reading comprehension was positive and statistically significant. This prompted rejection of the null hypothesis for being inconsistent with the results. Nonetheless, the effect was stronger in the experimental than in the control group; thereby, inducing the conclusion that training teachers is vital for imparting essential interactive skills, and for motivating them to apply multiple strategies to enable learners question what they read.

Key words: Interactive approach, instruction, reading, comprehension, learner-generated questions

INTRODUCTION

In Kenya, the national legislative and policy frameworks designate English language as the first language of instruction in basic education institutions. More explicitly, Article 7(2) of the Kenyan Constitution recognise English as one of the official languages to be applied in formal settings, including schools; while recommendation 102 of the Gachathii Commission demanded that English language be introduced as a subject from primary 1; and
as the superseding medium of instruction in primary 4 going upwards (Mose, 2017; Oluoch, 2017; Government of Kenya, 2010; Gachathi Commission, 1976). Such legal and policy directives suggest that English language occupies a central position in the instruction, learning and evaluation processes at both tiers of the Kenyan basic education system. It logically follows that learners’ proficiency in reading, writing and speaking English is critical for their performance, not only in the language itself, but also in other non-lingual subjects (Finney, 2013; Vries, 2011; Cox, 2009). Reading is identified in literature as the primary avenue through which learners improve their proficiency in English language. More specifically, Amartha (2013) describes reading as the process of identifying, extracting and constructing the meaning of written language or symbols. This is achieved when readers interact with written matter, generating speculative questions on the content of texts and making meaning while seeking appropriate answers to such questions. This makes reading an active process that goes beyond identification of written matter to establishing the meaning of such in isolation and in context (Palani, 2012). Amartha (2013) extends the thought by unpacking the skills that learners often deploy to make meaning of texts through an active reading process, including evaluation, judgement, self-questioning, prediction, imagination, summarisation, and problem-solving, among others.

While such skills are innate in all learners, the extent to which they are deployed in the reading process depends on the instructional methods chosen by English language teachers to activate them. Whereas good instructional methods make it easier for learners to extract messages conveyed by authors, inappropriate methods impede the meaning-making process and retention of the little that readers may pick from passages, which undoubtedly, impairs achievement in reading (Sencibaugh, 2007). Based on this understanding, the interactive approach instruction is identified as an effective method for activating and building learners’ requisite skills for reading written language and actively constructing the meaning of such (Nur and Ahmad, 2017; Amartha, 2013; Vries, 2011; Hudson, 2007).

‘Learner-generated questions’ is one of the essential skills encapsulated by the interactive approach instruction; which entails posing an array of questions about the subject of a text to be read, and seeking answers to such questions from the reading process. In this regard, Hirsch (2006) observes that as learners seek answers to their questions, they actively interact with texts in order to understand comprehension passages. Such interaction makes the reading process active and learner-centred, which is not only vital for improving achievement in reading comprehension, but also for lessening dependency on teachers and preparing learners for academic excellence. Alfassi (2004) commends learner-generated questions for improving awareness and knowledge, as well as enabling learners to connect previous information with new knowledge presented by comprehension passages.

Existing literature reveals that various studies have investigated the relationship between learner-generated questions, as a component of the interactive approach instruction, and the achievement in reading comprehension. A review of such literature further reveals two broad categories of studies based on the content scope, namely, general and specific. Whereas general studies, such as Nur and Ahmad (2017), Finney (2013), and Vries (2011), investigated the relationship between interactive approach instruction and learners’ academic performance; specific studies, such as Donggil (2016), Zwiers (2014), as well as Jenkins et al. (2013), examined the effect of learner-generated questions on the achievement in reading comprehension. Notably though, most of such studies have been conducted and published in developed countries of North America, Western Europe and Australia.

In Kenya, studies whose themes revolve around instructional methods, have mainly focused on identifying and explaining factors contributing to poor performance in national examinations, with very few focusing on English language. In this regard, persistent use of poor instructional methods appears in the findings of most studies, including Ongatoh (2017), Kathuri (2014) and Isutsa (2011), among others, as one of the factors contributing to learners’ poor performance in national examinations. Even though Commyrias and Inyega (2007) found that about one-third of teachers applied the interactive approach when teaching English comprehension, the procedures used by such teachers were incorrect; thereby, affecting learners’ achievement, as well as contributing to poor performance in English language examinations. In a national study, which investigated literacy levels in primary schools across East Africa, Uwezo (2012) found that in Kenya, only 32% of standard six learners could read a standard-two-level passage in English. The study attributed the low literacy level to inappropriate instructional methods. Like its peers, the study traced a connection between learners’ low literacy to poor performance in examinations.

In Vihiga County, poor performance in English language examinations has engrossed the attention of various stakeholders, including education managers, teachers, policy makers and researchers, as a key challenge to socio-economic development. Annual reports compiled by the Kenya National Examination Council (KNEC), for the period 2011 to 2014, show that the County’s performance in the Kenya Certificate of Primary Education (KCPE) English language paper has persistently remained lower compared to that of its neighbours such as Kisumu, Kakamega and Busia. Worse still, the reports show that performance has consistently remained lower in the comprehension section than in the grammar section of the English paper (KNEC, 2011; 2012; 2013; 2014). Figure 1 illustrates variations in learners’ performance among
Finney (2013) observes that learners’ achievement in English language determines how they perform in non-lingual subjects, transit to higher levels of education, and join the job market. Based on Finney’s line of thought, it is reasonably logical to postulate that in Vihiga County, the low achievement in reading comprehension constrains learners’ performance in English and other subjects taught using the language, constrains transition to secondary schools and affects the availability of skilled human resource in the County. In view of this, the KNEC reports identify poor instructional methods as a key factor constraining learners’ achievement in reading comprehension and overall academic performance.

Even though this study focused on Vihiga County, low achievement in reading comprehension and English language remains a pervasive challenge in the Kenyan basic education system. Despite this, none of the cited studies has exclusively assessed the causal relationship between learner-generated questions and achievement in reading comprehension, particularly in Vihiga County. To determine the significance of learner-generated questions, the study focused on establishing the truth value of the null hypothesis stating that ‘learner-generated questions’ has no significant effect on learners’ achievement in reading comprehension. In addition, the output of the study was expected to arouse interest among education researchers for further academic investigations not only in Kenya, but also in other developing countries. The study differs from its predecessors in terms of content scope by focussing on a specific aspect of the interactive approach interaction, rather than general factors influencing learners’ academic performance. The study also varies from its peers in terms of geographical setting, methodological approaches and analytical techniques.

**Literature review**

The interactive approach instruction is a hybrid model that harnesses the comparative advantages of the bottom-up and top-down approaches, in order to facilitate the reading process by encouraging readers to interact with texts so as to extract the meaning of written language or symbols (Sharpe, 2014; Hudson, 2007; Yan, 2002; Goodman, 1967). More particularly, the interactive approach instruction facilitates the reading process by stimulating constant interaction between bottom-up comprehension processing skills, such as word recognition and background knowledge; and top-down skills, including prediction, learner-generated questions and summarisation (Yan, 2002). In this regard, it assumes that the bottom-up and top-down comprehension processing skills contribute uniquely, while influencing...
The interactive approach instruction is depicted by existing literature as an effective method for activating learners’ comprehension processing skills, as a valuable antecedent to achievement in reading comprehension. In this regard, studies such as Finney (2013), Akbar and Majid (2011), as well as Vries (2011), among others, observe that the interactive approach instruction occupies a central position in learners’ academic performance in non-lingual subjects. Whereas learners with low achievement in reading comprehension struggle to cope with reading demands in other subjects, those with high achievement are quick to measure-up to reading tasks in non-lingual subjects (Vries, 2011).

The causal relationship between the interactive approach instruction and learners’ academic performance is a subject that has been investigated globally. Studies that delved into the causal connection between each component of the interactive approach instruction, including pre-reading questions, inserted questions, post-questions and self-questioning which aspects are found in learner-generated questions.

Questions generated by learners regarding the subject of text passages, are essential for improving their awareness, knowledge and comprehension of such passages. Learner-generated questions is an interactive instructional strategy through which learners during reading comprehension pose questions to themselves about a text and subsequently provide answers to the questions posed. This according to Alfassi (2004) is an active interaction between the learner and the text which is the essence of the interactive approach. In this regard learner-generated questions is a paradigm shift from the conventional approach where teachers are known to ask questions which they expect the learners to respond to, to an approach where learners generate the questions themselves as they read the text and respond to the same questions.

Engaging learners in pre-reading questions is an instructional strategy through which learners are allowed to ask questions before reading comprehension. The pre-reading questions could be generated from the context clues such as pictures, side notes, prefatory statements, tables, and graphs, all of which might be included in the reading passage. Pre-reading questions may involve either an individual learner posing questions to the class, or a small group of learners asking and discussing. These according to Anyiendah and Odundo (2017), facilitates learning because it increases sensitivity to learning by alerting the learner on the type of the assignment and its significance as well as a means to generalize, categorize and evaluate a comprehension passage. Moreover, it enhances cooperative learning among the learners which eventually makes the learners to not only feel confident but also develop positive interdependence which is an effective way of learning.

Inserted-questions is an instructional strategy through which a learner pauses to ask questions of themselves as part of the reading process. O’Malley et al. (1985) avers that when learners pause to ask a question on the text, it makes reading an active activity through which learners are actively interacting with the text clarifying issues that are not well understood and constructing meaning. In the same vein, Macaro (2006) observed that inserted questions are a form of reflective reading whose importance cannot be under-estimated. In this regard, learners should be taught to pause while reading and ask questions of ‘who, why and I wonder why’ as these may help learners improve in identifying the main idea in the text.

Post-reading questioning is an instructional strategy that has been used for long by teachers during teaching reading. Most teachers often ask questions after the reading comprehension to test learners’ accurate recall of information from the text. However, in the views of Plonsky (2011) learners can also be allowed to generate post-questions. This is because well-crafted questions may generate a discussion among the learners which eventually leads to new insights and better comprehension of the information in text. In this regard, teachers should take caution against poorly constructed questions by some learners which may stifle learning by causing confusion.

In relation to the self-questioning strategy, a positive correlation with learners’ achievement in reading has been reported by various studies, one of them being the study conducted by Macaro (2006) in Italy. Through self-questioning, learners gain opportunity to interact with texts, which is essential for improving their prior knowledge on comprehension subjects, as well as understanding text passages.

In the United States, Zwiers (2014) found that learners trained on how to question what they read performed better in comprehension questions than those not exposed to such training. The findings prompted the Zwiers (2014) to emphasise the need to train learners on how to generate meaningful questions at various stages of the reading process; as well as the need to train, support and facilitate teachers in order to improve the quality of training provided to learners. Still in the United States, Donggil (2016) established that ‘learner-generated questions’ was a core method for improving learners’ achievement in reading and performance, particularly by encouraging learners to interact with texts while seeking answers to the questions; the interaction process provided opportunity for understanding.

In their study, Jenkins et al. (2013), reported a significant correlation between the frequency with which teachers applied post-reading questions, which is a strategy of learner-generated questions, and learners’ performance in comprehension questions administered
after reading. In this regard, the higher the frequency of post-reading questions the better the scores obtained in follow-up tests. However, the authors faulted the strategy for promoting passive reading; which limited interaction with texts and prevented the creation of independent readers, who can tackle reading challenges under diverse contexts. In their review of the study, Chapman and Tunmer (2015) pointed out that post-reading questions were too insufficient to cause significant improvement in learners' achievement in reading comprehension, while Dubin (2016) noted that the strategy was unsuitable for reading lengthy comprehension passages.

In the United Kingdom, Chin and Osborne (2008) associated learners' questioning skills with significant improvement in the scores obtained by learners in comprehension tests. However, the authors noted that effectiveness of learner questioning skills rests on the availability of quality instructional resources, as well as skilled teachers who can provide continuous support. In Scotland, Farrell (2011) established a correlation between learner's performance in comprehension questions and the consistency of pre-reading questions to activate learners' questioning skills. Farrell (2011) observed that guiding learners to generate questions on the comprehension subject was critical for stimulating their understanding of texts ahead of reading lessons. Similarly, Hedge (2016) acclaimed pre-reading questions for its effectiveness improving learners' understanding of comprehension passages by enhancing awareness regarding the nature, context, content and significance of the subjects to be read.

A study conducted in Australia by O'Malley et al. (1985) also found that inserted questions and self-questioning strategies significantly correlated with learners' achievement in reading comprehension. The authors explained that both strategies encouraged interaction between learners and text passages, which in turn, improved their understanding of comprehension subjects and the ability to provide accurate responses to ensuing questions. Similar findings were reported in Italy by Macaro (2006), who established a positive correlation between the self-questioning strategy and learners' achievement in reading. The strategy contributed to learners' achievement in reading by providing opportunity for interaction with texts, which is not only crucial for evoking prior knowledge on comprehension subjects, but also improving the understanding of text passages.

This literature review confirms that learner-generated questions and achievement in reading comprehension are causally connected. Based on this, the conceptual framework presented in Figure 2 was created to show the hypothesised relationship between the two concepts. In this regard, 'learner-generated questions' was designated the independent variable and measured in terms of five perception statements, using a five-point Likert scale.
calibrated as 'strongly agree', 'agree', 'undecided', 'disagree', and 'strong disagree'.

Furthermore, achievement in reading comprehension was designated the dependent variable and measured in terms of performance in the post-intervention test, also referred to as post-test scores in some sections of the article. More still, the framework hypothesises that learner-generated questions affect the achievement in reading comprehension through a set of moderating variables, including learners’ attributes.

METHODOLOGY

The investigator applied a mixed methods approach to source, process, analyse and interpret information regarding the relationship between learner-generated questions and achievement in reading comprehension. The mixed methods approach harnesses the comparative advantages of the quantitative and qualitative research methods in order to determine causal relationships between two or more sets of phenomena. Even though the two methods are complementary, each has unique philosophical footing in terms of assumptions about phenomena (ontology), knowledge of the phenomena (epistemology), and particular ways of knowing the phenomena (methodology) (Wong, 2014; Ashley and Orenstein, 2005; Sale et al, 2002).

The study adopted the **Solomon Four Non Equivalent-Group Design** to guide the research process. In this regard, eight schools involved in the study were randomly assigned to the experimental and control groups. Whereas the experimental group consisted of schools code-named G, H, I and J, the control group was formed by schools K, L, M and N. Teachers of English language in the experimental group were trained on correct procedures for applying the interactive approach instruction which is inclusive of learner-generated questions. More still, schools G and H in the experimental group, and schools K and L in the control group were subjected to a pre-intervention test. At the end of the intervention period, all the eight schools were subjected to a post-intervention test. The design is acclaimed for being strong against **pre-test sensitisation effects**, that is, whether the act of taking a pre-intervention test influences scores obtained at the post-intervention test (Symmons, 2013; Boushey et al., 2006).

The study targeted public primary schools in Vihiga County, which consists of five Sub-Counties, namely, Vihiga, Sabatia, Emuhaya, Luanda and Hamisi. By the end of 2016, the County had about 361 registered schools; within which, all standard six learners and teachers of English language were targeted. A combination of census and purposive sampling was applied at various levels to obtain sample sizes, as indicated in Table 1, part A. In this regard, all the 5 Sub-Counties were involved in the study on the basis of census principles. In each sub-county, 2 schools were purposively included in the study, based on two criteria, viz. having participated in KCPE for at least five years, as well as rural-urban representation. The process yielded a total of 12 schools. From each school, 1 standard six teacher of English language was purposively selected for the study. In total, 420 learners were involved in the study, again, based on the principles of census. Table 1, part B shows the distribution of learners and teachers by gender.

Data collection instruments included a questionnaire for learners, a questionnaire and an interview schedule for teachers; an observation schedule as well as a pre-test and post-test tool for learners. The instruments were pilot-tested in 4 schools, 4 teachers and 140 learners between January and April, 2017. Necessary adjustments were effected based on the results and suggestions from respondents. Validity analysis obtained a Content Validation Index of 91.8%, for learners’ questionnaire, 87.8% for teachers’ questionnaire and 86.5% for the interview schedule. In each case, the results suggested that content validity was above the minimum threshold prescribed by Polit and Beck (2006). Reliability analysis obtained a Cronbach’s alpha ranging from 0.82 for the learners’ questionnaire to 0.9 for the observation schedule, which were above the minimum threshold for internal consistency based on the criterion developed by Ritter (2010).

Primary data were sourced between May and August, 2017, with authorisation from National Commission for Science, Technology and Innovation, and University of Nairobi. The process began with training teachers on correct procedures for applying the interactive approach instruction which includes the learner-generated questions. A pre-intervention test was administered to learners in the experimental group, followed by treatment, which lasted for three months. The investigator observed eight lessons in both groups to validate responses provided by teachers and learners. After the three months of treatment, learners in both groups were subjected to a post-intervention test, whose purpose was to check whether the activation of learner questioning skills caused any significant effect on their achievement in reading comprehension.

Both quantitative and qualitative techniques were applied to process and analyse data. Quantitative techniques included computation of mean scores, standard deviations, percentages, cross tabulations, as well as computation of independent sample t-tests. One-way Analysis of Variance was also performed to determine the significance of variations between the scores achieved by all the four groups, in relation to the independent variable. In addition, the null hypothesis was tested using linear regression analysis, which determined the effect of learner-generated questions on their achievement in reading comprehension. Linear regression models are based on the premise that $Y$ is a function of a set of $k$ independent variables $(X_1, X_2...X_k)$, as indicated...
Table 1. Sample sizes

<table>
<thead>
<tr>
<th>Part A</th>
<th>Sample size</th>
<th>Method of determination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td></td>
<td></td>
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<tr>
<td>Sub-counties</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Schools</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Teachers</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Learners</td>
<td>280</td>
<td>140</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part B</th>
<th>School</th>
<th>Learners</th>
<th>Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Girls</td>
<td>Boys</td>
</tr>
<tr>
<td>Luanda</td>
<td>G</td>
<td>19</td>
<td>16</td>
</tr>
<tr>
<td>Emuhaya</td>
<td>H</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Hamisi</td>
<td>I</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>Sabatia</td>
<td>J</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>Luanda</td>
<td>K</td>
<td>22</td>
<td>14</td>
</tr>
<tr>
<td>Emuhaya</td>
<td>L</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Hamisi</td>
<td>M</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>Sabatia</td>
<td>N</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
<td><strong>150</strong></td>
<td><strong>130</strong></td>
</tr>
</tbody>
</table>

in the formula (1):

\[ Y_j = \beta_0 + \beta_1 X_1 + \varepsilon_j \] .......................... (1)

Where: \( \beta_0 \) = intercept; \( \beta_1 \) = regression coefficient; \( \varepsilon \) = error term; \( Y \) = dependent variable; \( X_1 \) = independent variable (Morgan et al., 2007; Bryman and Cramer, 1998).

The model generated standardised regression coefficients (Beta weights), t-statistic and p-values, which enabled the investigator to fulfil the study’s objective. The effect of learner-generated questions on the achievement in reading comprehension was indicated by Beta weights. Whereas a negative (-) sign before a Beta weight shows a decreasing effect, a positive (+) sign indicates an increasing effect. Generally, the effect is nil at 0.0, but increases away from 0.0 in either direction (±). The bigger the deviation from 0.0, the stronger the effect associated with a particular independent variable (Morgan et al., 2007; Bryman and Cramer, 1998). The Statistical Package for Social Sciences (SPSS) facilitated quantitative data analysis.

Qualitative data were processed and analysed following three steps, including transcription and organisation in line with main themes; description to produce preliminary reports; and thematic analysis, which identified emerging sub-themes under each cluster, as well as patterns and trends of change in learners’ achievement in reading comprehension (Best and Khan, 2004).

The investigator conformed to three principles of research ethics, including respecting participants’ right to self-determination, as well as ensuring confidentiality and justice (Dench ef al., 2004). In this regard, the investigator obtained informed consent from parents and guardians before involving children in the study. The process involved writing brief letters, explaining purpose of the study, its potential benefits to the children and the importance of voluntary participation. Parents and guardians were further informed about their right to withdraw consent of participation for their children at any time before or during data collection without conditions of threats. Teachers involved as respondents were also taken through the consenting process. Besides, all participants were assured that the information obtained from them would be kept confidential, and used for the purpose of the research only. Confidentiality measures included ensuring anonymity of the schools and participants.

RESULTS

The results are presented under four sub-sections, including learners’ achievement in reading comprehension, bivariate analysis of learners’ profile and achievement in reading comprehension, bivariate analysis of learner-generated questions and achievement in reading comprehension, as well as multivariate analysis of learner-generated questions and achievement in reading comprehension. Details are presented and discussed under the following themes.

Learners’ achievement in reading comprehension

Of the 279 learners who participated in the study, 142 (50.9%) were in the experimental group, while 137 (49.1%) belonged to the control group. The study focused on determining if there was any significant difference in the achievement in reading comprehension between learners in the experimental group and those in the
control group. This was accomplished by applying the t-test for independent samples to determine if there was any significant difference in the mean scores obtained by learners in the two groups. As indicated in Table 2, part A, learners in the experimental group obtained a mean score of 35.59 (95% Confidence Interval [CI] = 34.71-37.07); while those in the control group scored 22.32 marks (95% CI = 21.46-23.18). It’s important to note that n stands for sample size, SD is the standard deviation, SE is standard error, Sig. is the significance (also known as p-value) and df is the degree of freedom.

In order to interpret the results correctly, it’s equally important for readers to understand that Levene’s test for equality of variance determines whether variances between two groups are equal or not. As a rule of thumb, if the significance value (Sig.) is greater than 0.05, then variances between two groups are assumed to be equal; hence, results are read from the first row (Table 2, part B). But if Sig. is less than or equal to 0.05, then variances between the groups are assumed to be unequal; hence, results are read from the second row. In addition, the difference of the mean scores between two groups or samples is indicated by the Sig. (2-tailed) column. Again, as a rule of thumb, if the value of Sig. (2-tailed) is greater than 0.05, then there is no significant difference between the means scores obtained by two groups. However, if the value of Sig. (2-tailed) is less than or equal to 0.05, then there is a significant difference in the mean scores.

In view of the stated principles, the results in Table 2, part B show that the Sig. value for Levene’s test was 0.000, which implies that equal variances were not assumed; hence, the results were read from the second row. In this regard, the analysis obtained a t-statistic of 18.355 with a significance value (Sig. [2-tailed]) of 0.000, which suggests up to 99% chance that the mean scores obtained by learners in the experimental and control groups were significantly different. Given that the mean score obtained by learners in the experimental group (35.89) was higher than that of learners in the control group (22.32), the results suggest up to 99% chance that the training provided to teachers on how to correctly apply the interactive approach instruction, enhanced learners’ achievement in reading comprehension.

**Bivariate analysis of learners’ profile and achievement in reading comprehension**

The scores obtained by learners in the post-intervention test were grouped into four categories of ‘<20 marks’, ‘20-29 marks’, ‘30-39 marks’ and ‘40+ marks’ to facilitate bivariate analysis. This changed the scale of measurement from interval to nominal. The resultant categories were cross-tabulated with learners’ attributes, including age, gender, school and sub-county of residence. The results presented in Table 3 show that 143 (51.3%) learners were 12 years old, 76 (27.2%) were aged 13 years, while 43 (15.4%) said they were 14 years old. In relation to achievement in reading comprehension, in the 20-29 marks category, 64 (49.6%) learners were 12 years old, 32 (24.8%) were aged 13 years, while 20 (15.5%) were oldest at 14 years. In the 30-39 marks category, 28 (47.5%) learners indicated 12 years, while 21 (35.6%) were 13 years old. Based on this, the analysis revealed up to 95% chance that learners’ achievement in reading comprehension significantly associated with their age (χ² = 13.082, df = 2 & p-value = 0.023).

Concerning gender, 130 (46.6%) learners were boys, while girls were 149 (53.4%). In relation to achievement in reading comprehension, the category of <20 marks included 20 (48.8%) boys and 21 (51.2%) girls, while in the category of 40+ marks were 22 (44.0%) boys and 28 (56.0%) girls. However, the analysis revealed lack of a significant association between learners’ gender and achievement in reading comprehension (χ² = 0.477, df = 3).
Table 3. Cross-tabulation of learners’ profile and achievement in reading comprehension

<table>
<thead>
<tr>
<th>Learners’ attributes</th>
<th>Post-test scores</th>
<th>Test results</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>&lt;20</td>
<td>20-29</td>
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<tr>
<td></td>
<td>Freq</td>
<td>%</td>
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<tr>
<td>Age</td>
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<tr>
<td>11 years</td>
<td>1</td>
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</tr>
<tr>
<td>12 years</td>
<td>22</td>
<td>53.7</td>
</tr>
<tr>
<td>13 years</td>
<td>11</td>
<td>26.8</td>
</tr>
<tr>
<td>14 years</td>
<td>7</td>
<td>17.1</td>
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<tr>
<td>15 years</td>
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<td>0.0</td>
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<tr>
<td>Total</td>
<td>41</td>
<td>100.0</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>20</td>
<td>48.8</td>
</tr>
<tr>
<td>Female</td>
<td>21</td>
<td>51.2</td>
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<tr>
<td>Total</td>
<td>41</td>
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<tr>
<td>School</td>
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<tr>
<td>Total</td>
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<td>100.0</td>
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<tr>
<td>Sub-group</td>
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</tr>
<tr>
<td>Pre-tested</td>
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</tr>
<tr>
<td>Not pretested</td>
<td>29</td>
<td>70.7</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>100.0</td>
</tr>
</tbody>
</table>

* ** *** show significance at p<0.1, p<0.05 and p<0.01 error margins, respectively.

& p-value = 0.924); which suggests lack of a significant difference between the marks obtained by boys and girls in the post-intervention test.

The results in Table 3 further show that learners were drawn from 8 public schools, coded as G, H, I, J, K, L, M and N. In this regard, 38 (13.6%) learners were sampled from school I, followed by 36 (12.9%) from schools K and M, each; while 35 (12.5%) were sampled from school G. The category of <20 marks, included 15 (36.6%) learners of school G, N, and 14 (34.1%) of school M. The category of 40+ marks consisted of 15 (30.0%) learners of school G and I, each; while 11 (22.0%) learners were members of school G. Based on this, the analysis revealed that learners’ achievement in reading comprehension significantly varied across the schools (χ² = 15.719, df = 9 & p-value = 0.013), meaning that some schools performed better than others.

Regarding the sub-groups, the result in Table 3 indicate that 139 (49.8%) learners were subjected to the pre-intervention test, while 140 (50.2%) were not. In connection to achievement in reading comprehension, the results indicate that in the category of <20 marks, the majority, 29 (70.7%) were not pre-tested, while 12 (29.3%) were. The upper category of 40+ marks, included 26 (52.0%) who were pre-tested 24 (48.0%) who were not. However, the analysis revealed lack of a significant association between learners’ pre-testing status and achievement in reading comprehension (χ² = 1.221, df = 3 & p-value = 0.374). The results suggest that exposing a section of the learners to pre-intervention test did not significantly influence how they scored in the post-intervention test. By minimising pre-test sensitisation effects, the results suggest that the Solomon Four-Group Design was applied correctly.

Bivariate analysis of learner-generated questions and achievement in reading comprehension

Learners were requested to indicate their opinions about each of five perception statements on a five-point rating scale, calibrated as ‘strongly agree’, ‘agree’, ‘undecided’, ‘disagree’, and ‘strongly disagree’. In this regard, the first perception statement posited that ‘I ask myself questions I like to be answered in the text’. The results in Table 4 show that of the 279 learners, 89 (31.9%) agreed with the statement, while 85 (30.5%) agreed strongly. However, 61 (21.9%) learners disagreed with statement, while 22 (7.9%) disagreed strongly. Cumulatively, 174 (62.4%) learners affirmed that they ask themselves questions that they would like answered by texts, while 83 (29.7%) never
ask themselves such questions. In connection to achievement in reading comprehension, the analysis show that in the category of <20 marks (n=41), 20 (48.8%) learners affirmed the statement, while 19 (46.3%) contested its correctness. Of the 50 learners who scored 40+ marks, 40 (80.0%) believed the statement was true, while 6 (12.0%) expressed contrary views. Based on this, the analysis revealed up to 905 chance that learners’ achievement in reading comprehension significantly associated with the practice of asking themselves questions they would like answered by texts ($\chi^2 = 22.499$, df = 12 & $p$-value = 0.032).

Learners indicated their thoughts regarding the second statement postulating that ‘I check to see if my guesses about texts are right’. As indicated in Table 4, 106 (38.0%) learners, agreed with the statement, while 37 (13.3%) strongly agreed. Collectively, about one-half of the learners, 143 (51.3%), acknowledged checking to see if their guesses about texts are right, while 121 (43.4%) felt the statement was untrue, because they never checked the correctness of their guesses about texts. In connection to learners’ achievement in reading comprehension, in the category of <20 marks (n=41), 21 (51.2%) refuted the statement, while 16 (39.0%) admitted that it was true. Among those who scored 40+ marks, 29 (58.0%) felt that the statement was true, while 17 (34.0%) indicated contrary views. Based on this, the analysis revealed up to 905 chance that learners’ achievement in reading comprehension significantly associated the practice of checking to see if guesses about texts are right ($\chi^2$ value = 19.674, df = 12 & $p$-value = 0.074).

Thirdly, learners stated their views the statement
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Figure 3: Learners’ aggregated views on the use of learner-generated questions when reading

saying that ‘I ask myself questions after reading passages’. Table 4 shows that 134 (48.0%) learners agreed with the statement, while 58 (20.8%) strongly agreed. On the opposite side of the scale, 33 (11.8%) learners disagreed with the statement, while 23 (8.2%) disagreed strongly. Cumulative results show that 192 (68.8%) learners approved the statement, while 56 (20.1%) said it was untrue. The results in Table 4 further show that among the 41 learners in the category of <20 marks, 24 (51.2%) affirmed the statement, while 15 (36.6%) indicated it was untrue. Among those who scored 40+ marks (n=50), 37 (74.0%) endorsed the statement, while 8 (16.0%) said it was inaccurate. The analysis further revealed up to 95% chance that learners’ achievement in reading comprehension significantly associated with the act of self-interrogation after reading passages($\chi^2$ value = 21.644, df = 12 & p-value = 0.042).

The fourth statement, on which learners expressed their opinions, claimed that ‘I go back and forth texts asking questions’. In this regard, 122 (43.7%) learners agreed with the statement, while 82 (29.4%) agreed strongly. Those who disagreed with the assertion were 34 (12.2%), while 22 (7.9%) disagreed strongly. Collectively, up to 204 (73.1%) learners affirmed the statement, while 52 (18.6%) refuted it. In connection to achievement in reading comprehension, the results in Table 4 shows that in the cluster of <20 marks (n=41), 25 (61.0%) learners upheld the statement, while 12 (29.2%) countered it. In the cluster of those with 40+ marks (n=50), the majority, 41 (82.0%), invalidated the statement, while 5 (10.0%) affirmed it. Despite this, the analysis revealed that learners’ achievement in reading comprehension and the practice of going back and forth texts asking questions did not add value to learners’ achievement in reading comprehension.

The fifth perception statement hypothesised that ‘When text is difficult, I read aloud to help me understand’. In response to this, Table 4 shows that those who disagreed with the statement were 139 (49.8%) learners, while 36 (12.9%) disagreed strongly. However, 51 (18.3%) learners agreed with it, while 43 (15.4%) indicate strong agreement. Cumulatively, the statement was confuted by 175 (62.7%) learners but affirmed by 94 (33.7%) learners. In relation to achievement in reading comprehension, in the category of <20 marks, 27 (65.9%) learners rejected the statement for being untrue, while 12 (29.3%) accepted it. In the group with 40+ marks (n=50), 32 (64.0%) said statement was incorrect about their reading practices, while 17 (34.0%) expressed positive views. Nonetheless, the analysis revealed lack of a significant association between achievement in reading comprehension and the practice of reading aloud to understand difficult texts ($\chi^2$ value = 10.271, df= 12 & p-value = 0.592).

The analysis further entailed aggregation of the five perception statements so as to generate optimal estimates regarding the extent to which learner-generated questions were applied during comprehension lessons. The output was measured in five categories of ‘very consistent’, ‘consistent’, ‘undecided’, ‘inconsistent’ and ‘very inconsistent’. Consequently, learners who strongly agreed with statements were assumed to be ‘very consistent’ in applying the learner questioning technique, during or after reading texts, while those who ‘strongly disagreed’ were assumed to be ‘very inconsistent’ in applying the same. The output was cross-tabulated with the variable learners’ group in order to bring out variation in the extent to which learners in the experimental and control groups questioned what they read. Figure 3 shows that 118 (42.3%) learners were consistent in generating
Table 5. Effect of interactive approach instruction on learners’ achievement

<table>
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<tr>
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<th>Unstandardized Coefficients</th>
<th>Standardised Coefficients</th>
<th>T</th>
<th>Sig.</th>
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<td>(Constant)</td>
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</table>

Dependent Variable: Post-test score

*, **, *** show significance at ρ<0.1, ρ<0.05 and ρ<0.01 error margins, respectively
† Converted to a dummy variable before inclusion into the linear regression analysis

Questions to help them understand what they read, while 27 (9.7%) were very consistent in doing so. Contrastingly, 61 (21.9%) learners were inconsistent in questioning texts, while 17 (6.1%) were very inconsistent.

Graph 2 further shows that those who were consistent in questioning texts, included 72 (50.7%) learners in the experimental group compared to 46 (33.6%) in the control group. Among those who were very consistent in generating questions when reading were 20 (14.1%) learners in the experimental group against 7 (5.1%) in the control group. Those who were inconsistent in applying the technique included 46 (33.6%) learners in the experimental group; while 11 (8.0%) learners in the control group compared to 6 (4.2%) in the experimental group were very inconsistent in applying the technique. Consequently, the analysis obtained a computed \( \chi^2 \) value of 29.204, with 4 degrees of freedom and a \( p \)-value of 0.000, which suggests up to 99% chance that learners in the experimental and control groups significantly varied in questioning what they read to facilitate understanding of texts.

Multivariate analysis of learner-generated questions and achievement in reading comprehension

The study focussed on determining the effect of learner-generated questions, as a component of the interactive approach instruction, on learners’ achievement in reading comprehension. In this regard, learner-generated questions (independent variable) were regressed against learners’ achievement in reading comprehension (dependent variable). Learners’ attributes (moderating variables) were included in the process to moderate the causal relationship between learner-generated questions and achievement in reading comprehension; thereby, provide the best estimate. The analysis process generated two models – one for the experimental group and one for the control group.

The results presented in Table 5 show that in both models, learner-generated questions caused a positive effect on learners’ achievement in reading comprehension (Model 1: \( \text{Beta} = 0.410, t = 1.931; \) Model 2: \( \text{Beta} = 0.396, t = 1.730 \)). This means that activation of learners’ ability to question the content of texts triggered a proportionate increase in learners’ achievement in reading comprehension. However, based on the magnitude of \( \text{Beta} \) weights and \( t \)-statistic, the effect was bigger among learners in the experimental group than among those in the control group, based on the magnitude of \( \text{Beta} \) and \( t \)-statistic. The variation suggests that subjecting teachers to training improved their effectiveness in activating learner-generated questions; thus, making them better than their untrained colleagues. More still, in Model 1, the results show up to 95% chance that the effect was significant \( (p = 0.046) \), while in Model 2, the effect was significant at 90% confidence level \( (p = 0.063) \). This led to rejection of the null hypothesis \( (H_0) \) stating that ‘learner-generated questions’ has no significant effect on learners’ achievement in reading comprehension in both Models for being inconsistent with empirical data.

The analysis of qualitative information revealed that in the experimental group learner-generated questions was applied moderately by teachers during comprehension reading lessons, while in the control group application of the skill was below average. The variation between the two groups suggests that comprehension reading lessons were relatively more active in the experimental than in the control group. Observations revealed that teachers in the experimental group made a greater effort to activate learner-generated questions when teaching reading
comprehension than their counterparts in control schools.

Teachers activated learner questioning skills using various strategies, including *pre-reading questions, inserted questions, self-questioning* and *post-reading questions*. While examining the extent to which teachers applied each strategy, the analysis focused on revealing factors constraining teachers’ efforts to activate learner-generated questions, before, during and after reading comprehension passages.

The analysis indicated that of the four strategies mentioned, *post-reading questions* was the most frequently applied to activate learner questioning skills, because it enables learners to summarise passages and explore additional areas of study. Besides, the strategy was commonly applied in both the experimental and control groups. Despite this, the strategy is faulted for being ineffectual in developing learners to become active readers, because it encourages passive reading of comprehension passages, before introducing a brief period of activity at the tail end, when oral or written questions are generated. In this regard, the strategy denies them the opportunity for active participation during reading, which renders it unsuitable for lengthy comprehension passages. In view of this, the strategy becomes less effective in improving learners’ achievement in reading comprehension, particularly when used alone.

The analysis revealed that *pre-reading questions* strategy was fairly common in the experimental group, but rarely used in the control group. The strategy involved active engagement of learners with questions around the subject of comprehension, prior to reading with the intention of provoking learners’ thinking and increasing awareness about the nature, context, content and significance of passages to be read. This approach was noted to be effective in increasing learners’ active interaction with texts, which is a crucial pre-requisite for improving learners’ understanding of comprehension passages.

The analysis further indicated that the use of *inserted questions* strategy was infrequent in both groups. However, the application of inserted questions was minimal in the experimental group, but rare in the control group, which constrained learners’ interaction with texts, monitor their understanding, check their predictions, as well as answer pertinent questions correctly. In this regard, participants blamed under-utilisation of the strategy to the assumption that such questions interrupted the reading process – a perception which impelled some teachers to deliberately ignore the inserted questions strategy in favour of post-reading questions. Notably, this assumption was more predominant among participants in the control group than among those in the experimental group.

Regarding *self-questioning* strategy, the analysis revealed that its application was uncommon in both the experimental and control groups. The strategy entails developing learners’ ability to form questions in their minds or jot them down, and seek answers during the reading process, which inevitably becomes active and interactive. Participants linked under-utilisation of the strategy to lack of awareness and requisite skills among teachers.

**SUMMARY AND CONCLUSIONS**

The study set to determine effect of learner-generated questions on the achievement in reading comprehension in Vihiga County; in order to generate citable facts that should support policy and programming interventions targeting the training, management and motivation of English language teachers. The ultimate goal was to improve the effectiveness of such teachers in activating learners’ questioning skills, in addition to prodding further research on the subject of learners’ achievement in reading comprehension, in Kenya as well as in other developing countries.

The findings show that in both models, learner-generated questions caused a positive effect on the achievement in reading comprehension (Model 1: $\beta = 0.410, t = 1.931$; Model 2: $\beta = 0.396, t = 1.730$); which suggests that as teachers activate learners’ ability to question the content of comprehension passages, there occurs a proportionate improvement in learners’ achievement in reading comprehension. Moreover, the variable’s effect seemed to be stronger in the experimental than in the control group, which suggests that teachers trained on the correct methods of applying the interactive approach instruction, were more effective in activating learner-generated questions, as well as applying the same to teach reading comprehensions, than their untrained colleagues in the control group.

More still, the findings suggest that trained teachers put in more effort in activating learners’ questioning skills during reading lessons than their untrained counterparts. The effect of learner-generated questions was found to be statistically significant at 95% confidence level in the experimental group ($\rho = 0.046$) and at 90% confidence level ($\rho = 0.063$) for the control group, which prompted rejection of the null hypothesis stating that ‘learner-generated questions’ has no significant effect on standard six learners’ achievement in reading comprehension, for being untrue.

Concerning the strategies for activating learner-generated questions, *post-reading questions* was the most frequently applied by teachers in both groups, particularly because the strategy enables learners to summarise passages in addition to exploring other areas of study. Despite this, the strategy is faulted for encouraging passive reading of comprehension passages, which constrained learners’ active participation in the reading process, which is critical for improving
achievement in reading. The pre-reading questions strategy was commonly applied in the experimental group, but rarely so in the control group; while the use of inserted questions and self-questioning strategies was uncommon in both groups. Nonetheless, in both groups, the results reveal teachers’ overreliance on a single strategy to activate learner questioning skills.

In conclusion, it’s worth noting that the effect of learner-generated questions on the achievement in reading comprehension was stronger in the experimental group than it was in the control group, which implies subjecting teachers to training made them more effective in activating learner-generated questions using, correct methods than their colleagues in the control group. In relation to this, Dubin (2016) notes that consistent application of learner-generated questions adds value by making lessons more active, participatory and engaging. In view of this assertion, comprehension reading lessons were more active in the experimental than in the control group. Consequently, training teachers on the correct methods of activating learner-generated questions is vital not only for the acquisition of essential skills, but also for motivating teachers to apply necessary strategies for evoking questions on text passages, consistently.

Teachers in both groups biasedly favoured the post-reading questions strategy, and deliberately ignored pre-reading questions, inserted questions and self-questioning strategies. In the control group, such biases were linkable to lack of awareness, in the experimental group the situation suggested that the training provided to teachers was insufficient. Even though post-reading questions is commended for enabling learners to summarise and understand passages, it’s equally admonished for encouraging passive reading, which prevents learners from active interaction with text passages and engagement with their peers about the same.

Over-reliance on post-reading questions strategy also delayed a paradigm shift from teacher- to learner-centred reading of comprehensions; thereby, preventing learners from enjoying benefits of being autonomy. The learner-centred approach enables learners to inter alia, build communication and social skills, develop thinking and problem solving skills, transfer knowledge to the real world, retain knowledge; as well as minimise dependency on teachers. In view of this, teachers of English language should be sensitised on the need to adopt a multi-strategy approach to encourage learners’ active participation in discussing and reflecting on the subject of comprehension passages, so as to augment achievement in reading comprehension.

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