# Harnessing Educational Technology to Stimulate Critical Thinking among Secondary School Learners for Sustainable Development in Kenya

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## ABSTRACT

*Critical thinking (CT) isan essential life skill that education should seek to equip learners with in order to actualize the attainment of Kenya's vision 2030 and the sustainable development goals (SDGS). Psychologists and philosophers argue that critical thinking provides individuals with the mental ability to think, inquire and interrogate phenomena in society which eliminates bias and blind acceptance of viewpoints. Individuals who are proficient in critical thinking are able to conduct strategic thinking, creative thinking and engage in appropriate decision making and problem-solving processes. Individuals empowered with these competenciesare characterized with the ability to adjust to diverse demands of their environment. Theoutcome are individualswho arehighly employable, adaptable and inquisitive with a knack to positively influence society with innovations and social reengineering of communities with ideas. There is apparent disconnect between the expected role of education in fostering critical thinking among learners in secondary schools in Kenya.Githui, Njoka and Mwenje (2017) established that the levels of critical thinkingamong secondary school learners in Nairobi and Nyeri Countieswas disturbinglyvery low.The scenario implies that students' mental abilities hardly perform beyond mere memorization of facts and information. Learners critically lack the abilities to synthesize, analyze and evaluate information. Such students graduate from school deficient in the life skills necessary for effective living, work performance and inability to engage in activities of daily living in society. Unfortunately, educators in majority oflearning institutions in Kenyalack an understanding of howeducational technologycan be harnessed to stimulatecritical thinking skills during teaching and learning processes. This is despite the fact that critical thinking can be infused in pedagogyacross all disciplines without occasioning expensive curriculum reviews. Thisstudyseeks to provideinsights and informationto educators and policy makers on how educational technology can be harnessed to stimulate critical thinking among learners during the teaching and learning process for sustainable development in Kenya.Objectives: The study was guided by the following objectives, which were to;discuss how to harness instructional resources to stimulate critical thinking during the teaching and learning process among learners for sustainable development in Kenya; assess how instructional techniques can be used to promote critical thinking among learners in secondary schools in Kenya and evaluate how assessment techniques can be used in developing critical thinking among learners in secondary schools for sustainable development in Kenya.Methodology:The study adopted the Social Cognitive Theory (SCT) propounded by Albert Bandura as its theoretical framework. The study relied on library review of secondary data and published reports regarding how to harness educational technology to stimulate critical thinking among secondary school learners in Kenya.*

**Key words**.critical thinking, creative thinking, decision making,educational technology,

inquisitiveness.

## INTRODUCTION

All over the world theabilityto think critically has become an essential lifeskill to all individuals today. This has partly been informed by the rapid changes in technology, theglobalization in economies, the expanding labour market and social changes. Healy (1990) stated that critical minds are increasingly gaining status as society's most valuable natural resource worthy of the effort and time needed to cultivate. In order to compete globally students must graduate from high school or college with the ability to problem solve and use critical thinking skills (Law &Kaufhold, 2009). Employers are looking for a work force that can think critically and produce results (Law &Kaufhold, 2009). Despite the importance of critical thinking as an educational outcome, Mendelman(2007)observes themajorityof schools miss toteachcritical thinking to their students andasa result, the majorityof thegeneral publicdo not practiceit at all. Arguing in the same vein, HayesandDevitt(2008)observedthat,criticalthinkingstrategiesarenot extensivelydevelopedorpracticedduring primary andsecondaryeducation, given the emphasis on memorization and rote learning with a motivation that to attain high academic scores in national examinations.

According to Peron (2010) the relationship between content and critical thinking presents a unique challenge to education. This is attributed to instructional requirements that place undue emphasis on mastery of core subject matter and stakeholder expectations of which make it which make it difficult if not impossible to focus instruction on teaching critical thinking skills. In this regard, Matheny (2009) shared that majority of teachers in public schools have become so overly focused on their students attaining high grades in examinations that many sometimes end up teaching the test itself. Jenkins (2009) points out that when critical thinking skills are omitted from the educational process, society misses tremendous benefits. In particular, students lack critical thinking skills inhibits in their' ability act appropriately to challenges they may encounter in new and unfamiliar situations that are helpful to intellectual development. In agreement to this view, Tsui (2002) noted that critical thinking skills challenge what is typically assumed by others and encourages learners to recognize the importance of different perspectives in problem solving.

Indeed, Willingham (2009), observed that development of critical thinking skills improves content uptake and retrieval through the concept of meaningful learning. Matheny (2009) proposed that critical thinking skills and core content acquisition support each other adding that the idea of choosing between the two is a false dichotomy. Matheny further emphasized that instruction in critical thinking and core content are designed to be delivered simultaneously. McCollister and Sayler (2010) supported this notion, confirming that critical thinking can be infused in lessons throughout all disciplines by utilizing in depth questioning and evaluation of both data and sources. Having students track patterns in information stimulates them to look at the information as a process instead of simply information to be memorized and helps them develop skills of recognition and prediction. Evaluation of information helps students to learn appropriate procedures for utilizing credible information, as well as helping them to learn acceptable and appropriate ways to use discretion (McCollister&Sayler, 2010). These skills are helpful in reading, comprehension and problem-solving skills, all of which play an important role in standardized

assessments (McCollister&Sayler, 2010). This deeper understanding allows the learners to better analyze the circumstances surrounding the occurrence and differing viewpoints about a phenomenon (Tsai, Chen, Chang & Chang, 2013).

Tsai, et al (2013) found that enhancing the critical thinking among students in science classes helped the students better understand the scientific process as well as encouraging students to become more experimental and inquisitive of the diverse facets of the sciences. Knodt(2009) stated that innovative thinking is enhanced when the natura linquisitiveness that students bring to the learning process isinspired ,affirmed, and cultivated.When given the opportunity to ask and explore openly, students acquire and blossom. This opportunity must be provided by the educator if students are to learn to be critical thinkers rather than critics. Opportunities must be provided for students to voice opinions and objections to topics rather than seek right or wrong answers. This brain storming process is necessary to fuel the continuing curiosity of the learner. Content knowledge is best taught using natural curiosity because there is an innate desire within every one to learn by challenging traditional thinking patterns (Healy,1990). Critical thinking, higher order thinking, and problem solving make learning motivating, stimulating, and enjoyable (Jensen,2005).

Choy and Cheah (2009) and Rowles, Morgan, Burns, and Merchant (2013) all found that teaching critical thinking skills can be enhanced by having a more standard definition of what critical thinking entails. This definition would allow educators at all grade levels to align the current curriculum with activities and lessons that help in cultivation of critical thinking among learners. In order to engage students in critical thinking, the teacher needs to act as a facilitator to give room for discussion and encourage a free thought process, as well as to encourage understanding that thinking critically does not always end with a right answer, but instead sometimes ends in more questions or differing evaluations of the theme (Arend, 2009). The teacher's role as facilitator also boosts a peer review process and helps students to learn appropriate responses to conflicting evaluations and opinions (Henderson-Hurley & Hurley, 2013).

Henderson-Hurley and Hurley (2013) suggested that the effort for more critical thinking is a holistic endeavor, which would require cooperation among different departments, divisions, and classes. The development of critical thinking skills is not only applicable to core subjects such as reading, math, language arts, science, and social studies. Kokkidou (2013) documented increases in creativity, innovativeness, as well as an increased awareness of the environment in which students and teachers live. Her findings established that by challenging students to think critically, teachers were finding themselves thinking more critically about their subject of expertise. Working to increase critical thinking by students has shown some promising results for both students and educators. The establishment of professional learning communities allows educators to think critically about the methods they are using to teach, and is a good starting point for ideas about inclusion of critical thinking skills in the classroom (Smith & Szymanski, 2013). Activities such as writing essays and utilizing questions that adhere to Bloom's Taxonomy higher order thinking are examples of ways to engage students in critical thinking in the classroom(Smith & Szymanski, 2013). Another option for an activity that helps to enhance critical thinking is the use of collaborative group works to solve problems/questions in education (Snodgrass, 2011). According

to Sadker and Sadker (2003) in an education that promotes critical thinking skills, learners are encouraged to interact with each other and develop social virtues such as cooperation and tolerance for different points of view.

The need to teach content is asignificant impediment to the teaching of critical thinking skills. However, Jenkins (2009) states that across all subjects' content knowledge should be taught through the integration of critical thinking the process should teach students to think. Engaging the brain through critical thinking and problem solving is much more beneficial than memorization of isolated facts (Matheny,2009). Other barriers to the teaching of critical thinking include the class size, the amount of time allocated per lesson and teacher attitude (Slavin,2009).The traditional pedagogical approach of the teacher serving as the deliverer of information and the student as a passive receiver of knowledge acutely impedes the development of critical thinking skills (Marzano,2007).This activity can be utilized by having students create a study groups about the subject content they are studying or by having them analyze the information currently available in existing resources. Teachers in a classroom integrate the content of different subjects and plan lessons that arouse curiosity and higher levels of knowledge. It is also important that any changes to the curriculum be met with training about the new activities and how to utilize them to their full effect.

Integration of critical thinking is very important in teaching at the secondary school level, because it promotes content analysis and evaluation which in turn have a positive impact on achievement of the students. In the area of critical thinking skills, few studies are available related to instructional design in Kenya. If teachers really want to modify the behaviour of learners in the classroom, it is indispensible to facilitate the critical thinking skills. Since studies are not available in area, the researcher has felt this as a need at present and hence the study. This paper explored level of critical thinking skills of learners in public secondary schools in Nyeri and Nairobi Counties in Kenya.

*Purpose of the Study*

This paper explored level of critical thinking among learners in public secondary schools in Nyeri and Nairobi Counties in Kenya. These two counties were assumed to be representative of Kenya due to the fact of their geographical and cultural backgrounds; Nairobi being the capital city in Kenya is highly cosmopolitan with dissimilar ethnic, racial, religious, social-economic and cultural backgrounds. On the other hand Nyeri is largely rural with a homogeneous population. The following research objective guided the research to assess the level of critical thinking skills among learners in public secondary schools.

*Hypothesis*

Ho1: There is no statistically significant difference in critical thinking among learners in boys, girls and co-educational schools.

Ho2: There is no statistically significant difference in critical thinking among in public secondary schools in Nyeri and Nairobi Counties.

## METHODOLOGY

The study employed a descriptive survey research design to examine critical thinking behaviours among learners in public secondary schools in Kenya. According to Kothari (2004) descriptive studies are intended to collect data relating to a phenomenon as it is devoid of any form of manipulation of the variables in the study. Further, descriptive design makes it possible to collect data over a large population within a short time (Kothari, 2004). This design was most suitable in relation to the variables of this research. Target population consisted of learners in public secondary schools in Nairobi and Nyeri Counties. Nairobi had 86 schools with an enrollment of 10,796 students, while Nyeri had 214 schools with 58,424 students ((MoEST, 2013; NyeriCounty office, 2013). Thus the total number of leaners in the two counties was 69, 220. The schools were stratified into three categories, namely; boys, girls, and co-educational (mixed) institutions. According to Kothari (2011) a sample size of 10% of the target population is an adequate representative for a large population. Thus, a sampling index of 0.1(10%) was selected from the three categories of schools, which gave; 2 boys' schools from each county and 2 and 3 girls' schools from Nairobi and Nyeri Counties respectively. Further, 17 and 4 mixed secondary schools in Nyeri and Nairobi Counties were sampled, this gave a total of 30 schools for the study. Sampling table by Kathuri and Pals (1993) was used to determine the sample size, which yielded a sample of 376 respondents for a population of 18,305 subjects. Since the sampled respondents were distributed in the 30 sampled secondary schools, the number of students selected from each of the schools was 13. The sample size of the study is presented in Table 1 presents.

Table 1: Sample Size

| **County** | **TotalNo.of schools** | | | **SchoolsSampled** | | | **StudentsSampled** | |
|---|---|---|---|---|---|---|---|---|
| | **Boys** | **Girls** | **Mixed** | **Boys** | **Girls** | **Mixed** | **Boys** | **Girls** |
| Nairobi | 20 | 24 | 42 | 2 | 2 | 4 | 52 | 52 |
| Nyeri | 19 | 25 | 170 | 2 | 3 | 17 | 137 | 150 |
| Total | 39 | 59 | 212 | 4 | 5 | 21 | 189 | 202 |

Data for this study was collected by means of a questionnaire administered to the students.

The questionnaire was adopted with modifications from Dindigal and Aminabhavi (2007) Psychosocial Competence Scale. The responses of the students were used to work out a mean score whichrated the learners' critical thinking skills on a scale of 1 to 5. Students who attained a mean score below 3.0 were rated as having a low level of the critical thinking skills, 3.0–3.9 represented a moderate level while mean scores that were above 4.0 were considered to exhibit a high level of the attribute. The computer software Statistical Package Social Sciences (SPSS) version 20.0 facilitated the data analysis. Data analysis generated frequencies, percentages, means and standard deviations used for description and inferential analysis.

Results and discussions

The findings of the study are presented according to the research objectives and hypothesis. The

research objective assessed the level of critical thinking skills among learners in public secondary schools in Kenya. The respondents were provided with items in a likert scale to indicate their opinion and the scores obtained were used to calculate a mean score ($\bar{x}$) of decision making skills of the respondents on a scale of 1 to 5. The findings are presented in Figure 1.

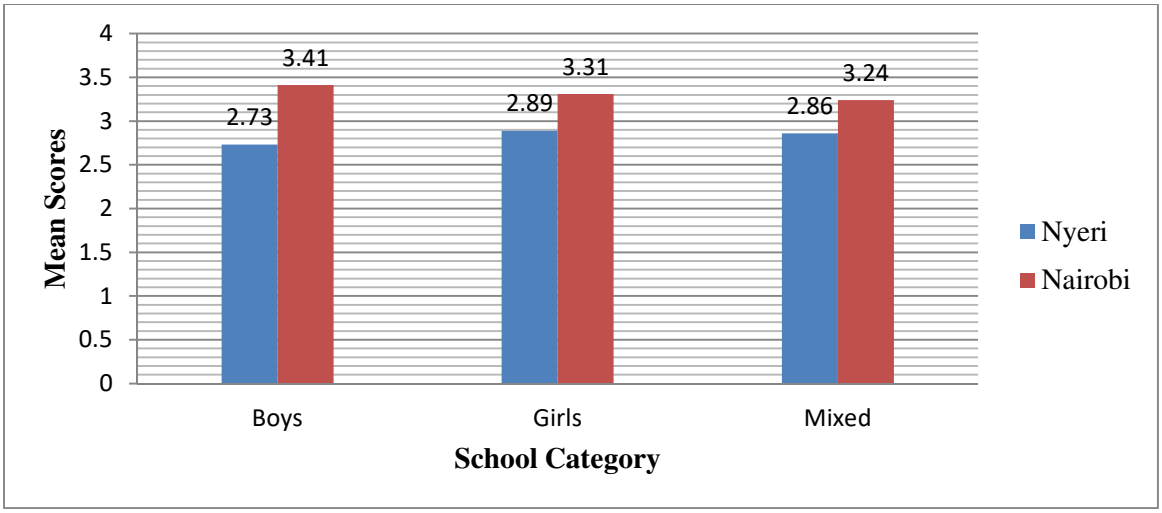


Figure 4.12 Critical Thinking Skills by School Category and County

Data analysis presented in Figure 1 clearly shows that learners in Nairobi County had higher levels of critical thinking skills compared to their counterparts in Nyeri County. In Nairobi County students in boys schools had a mean score of 3.41, mixed schools 3.24 and mixed schools 3.31. In Nyeri County, students in girls' schools had the highest mean ($\bar{x}$ =2.89), this was followed by mixed schools ($\bar{x}$ =2.86) while boys schools came last with a mean of 2.73. The findings of this study concurs with a study conducted by Aliakbari and Sadeghdaghighi (n.d) among Iranian students found out that students had low levels of critical thinking, in addition the study further revealed differences between male and female students in critical thinking ability with male learners outperforming their female counterparts. Floyd (2011) states that there are widespread perceptions that students from rural areas have low critical thinking skills compared to learners from urban settings due to their strong cultural orientation. However, instead this view, more credence is being given to aspects such as linguistic aptitude and educational experience as contributing factors to learners' capability to exhibit critical thinking. The apparent deficiency in critical thinking abilities among student in Nyeri may be due to the fact that they have been raised under coherent societal norms where community welfare and traditional values are stressed. Consequently, rural communities place a lot of prominence on displaying regard for authority and conforming to the demands of societal values rather than standing out on individual convictions. This could be among the variables contributing to differences in critical thinking abilities between learners in Nyeri and Nairobi counties.

It had been hypothesized that there is no statistically significant difference in critical thinking among learners in boys, girls and co-educational schools. To test this hypothesis, one way Analysis of Variance (ANOVA) was computed. The statistical relationship between the levels of critical

thinking skills among learners in boys, girls and mixed public secondary schools was presented as shown on Table 1.

Table 2. ANOVA

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 15.221 | 29 | .525 | .849 | .694 |
| Within Groups | 234.935 | 380 | .618 | | |
| Total | 250.156 | 409 | | | |

Table 2 shows that the results yielded p-value = .694 which was more than the alpha value $\alpha > 0.05$ indicating that the differences in critical thinking was not statistically significant. Therefore the null hypothesis was accepted and it was concluded that the critical thinking skills of learners in boys, girls and mixed secondary schools were basically similar. Inferential analysis results obtained from the computed value of ANOVA indicated the contrary; the differences observed were not statistically significant. This suggested that the overall critical thinking skills of learners in different school categories were the same. This agrees with the observations of Peron (2010) observed no differences in critical thinking skills among learners in different school categories. This was attributed to similar classroom practices and instructional strategies did not push students to give evidence and to reason; schools did not employ pedagogical approaches such as debates, brainstorming, journal writing, and questioning techniques in a way that stimulates development of critical thinking in the classroom. As a result learners did not develop high levels of critical thinking despite being in different school categories. Consequently, the similarities in the instructional techniques in different school categories could be a contributing variable to similarities in learners' critical thinking abilities.

It had also been hypothesized that there is no statistically significant difference in critical thinking among in public secondary schools in Nyeri and Nairobi Counties. To test this hypothesis, independent sample t- test was computed for the means of the decision making skills for the rural and urban adolescents. The findings are provided in Table 3.

Table 3. Independent sample t- test

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Critical thinking | Equal variances assumed | 3.352 | .068 | -4.869 | 409 | .000 | -.46846 | .09621 | -.65759 | -.27933 |
| | Equal variances not assumed | | | -5.127 | 192.381 | .000 | -.46846 | .09137 | -.64867 | -.28825 |

Analyzed data presented in Table 3 showsthat the level of significance .000 was less that the p-value (.05). Therefore the null hypothesis was rejected, Ho2 (at $\alpha$ =.05) andconcluded that there is a statistical difference in critical thinking among adolescents in Nyeri and Nairobi Counties were different. This concurs with Leipert et al. (2012) who observed that several features of the rural context, such as geographical, sociocultural, economic, and health care contexts, are relevant to understanding the critical thinking skills of rural adolescents. Rural communities tend to be more

religious and hold traditional values and beliefs, which can preclude rural adolescents from being assertive (Riddell et al., 2009). Therefore the contextual variables in the rural and urban settings could be stimulating acquisition of the critical thinking skills among the learners differently.

## CONCLUSION

Descriptive analysis established that learners in Nairobi County had higher levels of critical thinking skills compared to their counterparts in Nyeri County. The apparent deficiency in critical thinking abilities among student in Nyeri may be due to the fact that learners in Nyueri County have been raised under coherent societal norms where community welfare and traditional values are stressed. Rural communities place a lot of prominence on displaying regard for authority and conforming to the demands of societal values rather than standing out on individual convictions. Inferential analysis results obtained from the computed value of ANOVA for the different school categories indicated the contrary; the differences observed were not statistically significant, suggesting that the overall critical thinking skills of learners in different school categories were the same. This was attributed to similar teaching methods across schools which could be contributing to similarities in learners' critical thinking abilities. However, independent sample t-test indicated that there was a statistically significant difference in critical thinking among learners in Nyeri and Nairobi Counties. These differences were attributed contextual variables in the rural and urban settings could be stimulating acquisition of the critical thinking skills among the learners differently.

## RECOMMENDATIONS

The findings elicit several suggestions for practice of instructional approaches in secondary schools in Kenya in addressing the apparent deficiencies in critical thinking skills among learners. From the findings of this study it is recommended on the need to address the instructional procedures used by secondary school teachers so as to stimulate critical thinking skills among learners in both counties. It is also important that acknowledge that the rural environment is not inspiring learners enough towards acquisition of critical thinking skills. In this regard, secondary schools in rural areas ought to put in place mechanisms that would compensate for this shortfall.

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