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# Measuring ICT Integration for Collaborative Learning

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**Abstract**: Portable technologies offer new opportunities for learning, in which, learning collaboratively has become an extremely important skill. Technology causes learners to be more engaged and often retain more information. Funding for technology has brought teacher and learner digital devices to a large number of classrooms in basic education. Given the vast resources invested in digital devices by the governments, measuring the level of ICT integration for collaborative learning in basic education is of crucial importance. The study established that 57.3% of variation in Collaborative learning in Basic Education was accounted for by Indicators of ICT Integration, The ICT integration framework for collaborative learning (IIFCL) so developed showed the critical indicators to measure the level of ICT integration for collaborative learning in basic education.

**Keywords**: Collaborative learning, ICT Integration, Portable technologies, Digital devices.

## I. INTRODUCTION

According to UNESCO (2012) it was observed that ICT has transformed learning in primary schools and ICT integration in schools should focus more on the whole activities, content, events, and interpersonal processes taking place in the learning activities. According to GoK (2016) ICT is an enabler for socio economic transformation and also its infrastructure facilitates the processing and dissemination of effective innovation system and research. The ICT policy development in Africa including Cameroon, have often strived to match the international ICT education policy. Despite the massive investment in ICT integration in many schools, practical ICT tools use in schools is still limited (Howie, 2010). In Kenya today we have the ICT policy which was developed in 2019 and the other which was developed in 2006. The policies provide the guideline on implementing integration of ICT in learning (Gok,2006; GoK, 2019). However, there is limited literature on availability of ICT policies in primary schools.

A study done by Zhao and Cziko (2001) observed that when introducing ICT into classrooms by teachers, the teachers should believe in the effectiveness of technology, believe that using technology will not cause any disturbances and the teachers should have control over the technology. According to Smeets (2005) majority of the teachers do not make use of ICT to influence the quality of learning environment.

The expertise and skills of teachers affect the performance of pedagogical developments, according to Pelgrum (2001). It was found that one of the key barriers to ICT use in education is teachers' lack of expertise and skills in both developed and underdeveloped countries (Mamun & Tapan, 2009). While awareness of the subject area, how learners learn, and a degree of technological competence are needed to integrate technology into the curriculum (Morgan, 1996).

A study conducted in Bangladesh found that in-service teachers and principal's training for both and pre-service training for newly appointed teachers must be given diligent attention before entering the daily classes to familiarize them with the important role of technology in school environments and to educate them on how to plan and use ICT competently (Mamun & Tapan, 2009). Teachers should feel confident and secure using computers to incorporate technology in the classroom by using computers on a regular basis for teaching operations (Khan, Hasan, & Clement, 2012). The current study established whether in-service training of teacher exists for teachers and heads of institutions and pre-service training for teachers newly appointed in order for them to be familiar with the essential technology role in school environments and to sensitize them on planning and using ICT competently.

ICT integration in primary schools enables teachers to act as if they were themselves learners in a computer-enhanced environment (Hardy and Kirkwood, 1994). One big area, the Internet, of ICT is full of deceptive, inappropriate data which could hurt young pupils in primary schools. Teachers of ICT tend to be highly sensitive and effective in provision of pedagogical guidance, fostering protection of Internet, teaching learners moral conduct for educational, recreational, and interpersonal purposes while browsing the Internet. In addition, teachers would be better prepared to involve students in meaningful online interaction if they are concerned about website management and potential threats on the Internet, and will use the Internet more comfortably as a tool of teaching (Anastasiades & Vitalaki,2011). Therefore, teachers play a role in evaluating all the information available on the dangers associated with the use of the Internet and what appropriate training to protect students is required, and therefore guiding learners on Internet protection.

Postholm (2006) suggests that, through dialogues with students, teachers serve as advisors in the ICT classroom. In order to promote learning, ICT will mediate contact between teachers and students, but at the end of the day, teachers are

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required to make this interaction possible (Uibu and Kikas, 2008). In any ICT-enhanced learning environment, ICT cannot replace human interaction where a key role is played by teachers in promoting learners interactions among themselves. The current study established the level of competency of teachers by establishing digital devices used in school, digital devices owned by teachers, browsers used by teachers, experience of using portable devices and courses done by teachers.

School teachers in South Korea must take part in career development activities. The government mandates a minimum of 20 hours of career advancement for each teacher each year. However, in order to keep up with emerging innovations in their fields of specialization, the bulk of teachers attend career development activities between 40 and 60 hours. Korean educators share thoughts and help each other. More experienced teachers partner with less experienced teachers and give them lesson plans and classroom activities every week. Materials, including worksheets, guide books and technology-based events, are made available on a special website every week and are made available to all teachers. The guide books provide teachers with valuable tools that include; guidelines of activities for the group, lesson plans, and comprehensive requirements for objectives of the curriculum for teaching. Usually, teachers rotate every 5 years between classes. This seeks to provide fair educational opportunity for both students and teachers, independent of the socio-economic status of the society in which the school is situated (Sami, 2013).

Most recently, Korea has become the first country in the world to replace electronic copies of printed textbooks. These immersive versions use existing textbook content that include new media technologies such as animation, video images and virtual reality. The Digital Textbook marketing policy was developed to make high-quality digital textbooks ideal for the future educational environment and to promote the " Knowledge Korea " goal by establishing a national teaching-learning database and distributing such information worldwide. The keystone of successful integration of technology in South Korea's education is highly qualified teachers (Severin & Capota, 2011).

As an attempt to integrate ICT into classroom, the creation of educational instructional materials for ICT is crucial. In the Republic of Southern Korea, educational content was being produced since the late 1980s. Educational materials includes texts, video clips, graphics and photographs and collected multimedia resources. ICT infrastructure has been identified by the New Partnership for African Development (NEPAD) as a priority area for action to establish conditions for sustainable development. The E-Africa Commission, which was established in 2002, implements NEPAD policies and programmes relating to ICTs. Six areas of high priority were established by this fast tracking of ICTs. One of these is the NEPAD e-Schools Project, which aims to incorporate ICT into the delivery of basic education curricula to enhance quality education.

ICT Transforming Education in Africa was a three-year project that was launched in 2015 to tap into the potential of ICTs for quality, equitable and inclusive education in Mozambique, Rwanda and Zimbabwe. In Mozambique, Rwanda and Zimbabwe, the overall objective was to build and evaluate models of exploiting ICTs in education. This was to help to find creative strategies for the achievement of quality, equality and inclusion in African education. Teachers and pupils, primary and secondary public schools, higher education agencies, policy makers, educational administrators and leadership were the beneficiaries (GoK, 2006).

There are two fundamental criteria for the digital technology implementation by formal education systems: firstly, the technology should be pedagogically efficient and must be seen as an enhancement; secondly, the technology should be available and usable. According to Robinson (2003), most in-service teachers have a narrow view of technology integration. Most student teachers (70%) believe that technology is a teaching tool and most of them do not link it to pedagogy or identify how it can help them develop their teaching or promote learning. An instructor with little understanding of the purpose of technology adopting in learning is less effective in an environment where technology-based learning take place (Robson, 2003).

Training in technology requires one to pay attention to required instructional technics in order to infuse learning process with technological skills(Means,1994). Technology potentially encourages change in teaching at school, learning and evaluation of learners and can connect economic and social growth with educational policy (Jan O'Sullivan, 2015). Currently majority of school in Kenya are equipped with laptops and tablets (Mugo, 2017). However, the extent of integration is not measurable.

Research findings (OECD 2015) suggest that the pedagogical orientation of a teacher is a key factor in how digital technology is used in the classroom. After having the technology accessible and available, incorporating technology is what comes next. The target of complete technology incorporation is inevitably unattainable: innovations are emerging and growing, learners and teachers are coming and going – things are shifting. It is the process by which individuals and their organizational environments adapt to the technologies that matters most. Integration of technology in learning is continual transition, learning, and enhancement. It is also crucial for its successful incorporation to create a culture that supports technology; such as using email to deliver essential messages or allowing workers to arrange meetings using electronic calendars, cultivating a culture that recognizes technology as natural to the day-to-day work (Baytak, Tarman, & Ayas, 2011).

According to Jan O'Sullivan (2015), the TPACK framework provides educators with a model to decide how their knowledge intersects to efficiently using technology in promoting learning centered on the three fields. Content Knowledge (CK) focuses on educators' comprehension of the subject, including the "deeper knowledge fundamentals of

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the disciplines" taught by an educator. Pedagogical Knowledge (PK): focuses on educational practice, specifically the knowledge of learning theories, teaching techniques, student evaluation strategies, and learning environment applications. Pedagogical Content Knowledge (PCK): incorporates the elements of pedagogical knowledge and knowledge of content, focuses on the ability of an instructor to reflect the subject in a way that takes into account student learning interests and prior content-related knowledge with the ultimate aim of increasing student understanding. Technological Knowledge (TK): highlights the knowledge of educators about the technological resources available and their capacity to accomplish selected tasks. Technological Content Knowledge (TCK): highlights the willingness of educators to consider how particular innovations can be used within the content field to efficiently facilitate student learning The greatest challenge is how to measure the utilization of the digital devices to enhance collaborative learning in schools.

A study by Kamau (2014) showed that a variety of restrictions hindered teachers from integrating ICT into their classes, including teachers who lacked the required training for ICT adoption in learning, lacked ICT tools and facilities and lacked time; lack of institutional support; and school principals who lacked ICT expertise to integrate ICT into their school leadership positions. In Kenya today, more than 89.2 percent of all public primary schools have been equipped with the Digital Learning Programme (DLP) tools: Learner Digital Devices (LDDs) 981,085; Teacher Digital Devices (TDDs) 38,768; Digital content Server and Wireless Router (DSWR) 19,384 and Projector 19,384) as indicated in figure 2.1, over 91,000 teachers have been trained on device utilization, an improved number of pupils' enrolment in Basic Education, has been realized and over 95% of schools are connected with power (Mugo, 2017). Therefore, the current study evaluated the indicators of ICT Integration in basic education to measure the level of ICT integration for collaborative learning.


**Figure 1: Digital Devices**

## II FINDINGS, INTERPRETATION AND DISCUSSION

This section presents the finds, interpretation and discussion of the study. The quantitative data was analysed using both descriptive and inferential statistics. The descriptive data was used to describe and summarized the data inform of graphs, tables, charts, frequencies and percentages. Inferential statistics was to make inferences and draw conclusions. Pearson moment correlation was used to establish the relationship between indicators of ICT Integration and Collaborative Learning in basic education. Regression analysis was used to measure the influence of ICT Integration on Collaborative Learning in basic education.

### The rating of the Indicators of ICT Integration

The study sought to establish the Indicators of ICT Integration in School in this study. Indicators of ICT Integration in School was considered vital for this study because it enables the researcher to establish the level of Integrating of Technologies in Basic Education to enhance Collaborative Learning. The study sought to find out the level of agreement on the indicators of ICT integration using the scale rating scale Indicated as: 1 = strongly disagree, 2 = Disagree, 3 = No idea, 4 = Agree, 5 = Strongly Agree.

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## TABLE 1: INDICATORS OF ICT INTEGRATION

| | Indicators of ICT Integration | Frequency/Percentage 1 | 2 | 3 | 4 | 5 | Mean Rate |
|---|---|---|---|---|---|---|---|
| i. | There is a clear institutional policy regarding the use of ICT in my school. | 138(29.7) | 117(25.2) | 117(25.2) | 67(14.4) | 25(5.4) | 2.4 |
| ii. | Adequate support is provided by administration for Every classroom teacher to use learning technologies to enhance their learners' learning in every subject | 105(22.6) | 122(26.3) | 60(12.9) | 150(32.3) | 27(5.8) | 2.7 |
| iii. | Vigilant attention is given to in-service teacher training for both teachers and heads of institutions | 153(33.0) | 103(22.2) | 80(17.2) | 103(22.2) | 25(5.4) | 2.4 |
| iv. | Vigilant attention is given to pre-service training for newly appointed teachers before joining the regular classes to acquaint them with the important role of technology in school settings | 139(30.0) | 123(26.5) | 9620.7 () | 87(18.8) | 19(4.1) | 2.4 |
| v. | Vigilant attention is given to pre-service on how to prepare and use ICT competently | 154(33.2) | 106(22.8) | 105(22.6) | 74(15.9) | 25(5.4) | 2.4 |
| vi. | If teachers and learners are made aware of the importance of Portable Technology Integration in the classroom, more teachers and learners will be willing to use the Portable Technologies | 40(8.6) | 19(4.1) | 48(10.3) | 197(42.5) | 160(34.5) | 3.9 |
| vii. | In-service teacher training is given to teachers on how to prepare and use ICT competently | 90(19.4) | 101(21.8) | 90(19.4) | 125(26.9) | 58(12.5) | 2.9 |
| viii. | In my class Collaborative learning involves peer coaching using digital devices | 106(22.8) | 158(34.1) | 60(12.9) | 108(23.3) | 32(6.9) | 2.6 |
| ix. | In my school teachers interact among themselves using digital devices | 68(14.7) | 46(9.9) | 31(6.7) | 229(49.4) | 90(19.4) | 3.5 |
| x. | Teachers improve their performance by learning from other teachers through digital devices | 49(10.6) | 53(11.4) | 51(11) | 227(48.9) | 84(18.1) | 3.5 |

**Source: Research data (2019)**

From table 1 the findings reveal that there is a clear institutional policy regarding the use of ICT in school as indicated by the respondents rating of 2.4 which was below average rating on a scale of 1 to 5 where 1 being the lowest rating and 5 the highest rating. 92(19.8%) of the respondents agreed that There is a clear institutional policy regarding the use of ICT in school.

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Concerning adequate support provided by administration for every classroom teacher to use learning technologies to enhance their learners' learning in every subject, the respondents rating was 2.7 which was above average rating. The findings indicated that 177(38.1%) respondents agreed there was Adequate support provided by administration for Every classroom teacher to use learning technologies to enhance learning in every subject.

Concerning vigilant attention given to in-service teacher training for both teachers and heads of institution, the respondents rating was 2.4 which was below average rating. The findings indicated that only 128(27.6%) respondents agreed that Vigilant attention was given to in-service teacher training for both teachers and heads of institution.

Concerning Vigilant attention given to pre-service training for newly appointed teachers before joining the regular classes to acquaint them with the important role of technology in school settings, the respondents rating was 2.4 which was below average rating. The findings indicated that only 106(22.8%) respondents agreed that there was vigilant attention given to pre-service training for newly appointed teachers before joining the regular classes to acquaint them with the important role of technology in school settings.

Concerning vigilant attention is given to pre-service on how to prepare and use ICT competently, the respondents rating was 2.4 which was below average rating. The findings indicated that 99(21.3%) respondents agreed that there was vigilant attention is given to pre-service on how to prepare and use ICT competently.

The study established that If teachers and learners are made aware of the importance of Portable Technology Integration in the classroom, more teachers and learners will be willing to use the Portable Technologies, the respondents rating was 3.9 which was above average rating. The findings indicated that 357(76.9%) respondents agreed that If teachers and learners are made aware of the importance of Portable Technology Integration in the classroom, more teachers and learners will be willing to use the Portable Technologies.

Concerning In-service teacher training is given to teachers on how to prepare and use ICT competently, the respondents rating was 2.9 which was above average rating. The findings indicated that 183 (39.4%) respondents agreed that In-service teacher training was given to teachers on how to prepare and use ICT competently.

Concerning Collaborative learning involves peer coaching using digital devices in class, the respondents rating was 2.6 which was above average rating. The findings indicated that 140 (30.2%) respondents agreed that there was Collaborative learning involves peer coaching using digital devices in class.

Concerning teachers interacting among themselves using digital devices in school, the respondents rating was 3.5 which was above average rating. The findings indicated that 319 (68.8%) respondents agreed that there was teachers' interaction among themselves using digital devices in school. Concerning teachers interacting among themselves using digital devices in school, the respondents rating was 3.5 which was above average rating.

Concerning Teachers improving their performance by learning from other teachers through digital devices, the respondents rating was 3.5 which was above average rating. The findings indicated that 311 (67.0%) respondents agreed that there was Teachers improvement in their performance by learning from other teachers through digital devices.

To establish the influence of Indicators of ICT Integration on collaborative learning in Basic Education. Pearson product moment correlation coefficient was calculated and results were as shown in Table 2.

**Statistical relationship between Indicators of ICT Integration on collaborative learning in Basic Education**

To establish whether there was any statistical significant relationship between Indicators of ICT Integration on collaborative learning in Basic Education, Pearson product moment correlation coefficient was calculated and results were as shown in table 2.

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**TABLE 2: THE RELATIONSHIP BETWEEN INDICATORS OF ICT INTEGRATION ON COLLABORATIVE LEARNING IN BASIC EDUCATION**

| | | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 |
|---|---|---|---|---|---|---|---|---|---|---|
| There is a clear institutional policy regarding the use of ICT in my school X1 | Pearson Correlation | 1 | | | | | | | | |
| | Sig. (2-tailed) | | | | | | | | | |
| Adequate support is provided by administration for Every classroom teacher to use learning technologies to enhance their learners' learning in every subject X2. | Pearson Correlation | .548** | 1 | | | | | | | |
| | Sig. (2-tailed) | .000 | | | | | | | | |
| Vigilant attention is given to in-service teacher training for both teachers and heads of institution X3 | Pearson Correlation | .497** | .473** | 1 | | | | | | |
| | Sig. (2-tailed) | .000 | .000 | | | | | | | |
| Vigilant attention is given to pre-service training for newly appointed teachers before joining the regular classes to acquaint them with the important role of technology in school settings X4 | Pearson Correlation | .515** | .604** | .665** | 1 | | | | | |
| | Sig. (2-tailed) | .000 | .000 | .000 | | | | | | |
| Vigilant attention is given to pre-service on how to prepare and use ICT competently X5. | Pearson Correlation | .499** | .467** | .621** | .732** | 1 | | | | |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | | | | | |
| If teachers and learners are made aware of the importance of Portable Technology | Pearson Correlation | .060 | .245** | .134** | .119* | .119* | 1 | | | |
| Integration .in the classroom, more teachers and learners will be willing to use the Portable Technologies X6 | Sig. (2-tailed) | .193 | .000 | .004 | .010 | .010 | | | | |
| In-service teacher training is given to teachers on how to prepare and use ICT competently X7. | Pearson Correlation | .300** | .395** | .380** | .469** | .436** | .241** | 1 | | |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | .000 | .000 | | | |
| In my class Collaborative learning involves peer coaching using digital devices X8 | Pearson Correlation | .418** | .460** | .281** | .362** | .360** | .409** | .302** | 1 | |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | .000 | .000 | .000 | | |
| Collaborative Learning X9 | Pearson Correlation | .506** | .588** | .442** | .537** | .499** | .346** | .482** | .607** | 1 |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | .000 | .000 | .000 | .000 | |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

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Table 2 shows Pearson correlation coefficient the Relationship between Indicators of ICT Integration on collaborative learning in Basic Education. This was the first step in establishing the influence of Indicators of ICT Integration on collaborative learning in Basic Education. Multiple regression analysis was computed so as to determine the inter correlation among the variables. In determining the multiple regression analysis; it is necessary to first determine Coefficient of determination and the regression analysis of variance. The findings are presented in Tables 3, 4 and 5

**Table 3: Coefficients of determination of Indicators of ICT Integration on collaborative learning in Basic Education**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .757a | .573 | .565 | .66493 |

Learning from other teachers through digital devices, vigilant attention is given to in-service teacher training for both teachers and heads of institution s, If teachers and learners are made aware of the importance of portable technology integration in the classroom, more teachers and learners will be willing to use the Portable Technologies, In-service teacher training is given to teachers on how to prepare and use ICT competently, a clear institutional policy regarding the use of ICT in my school, adequate support is provided by administration for every classroom teacher to use learning technologies to enhance their learners' learning in every subject, vigilant attention is given to pre-service on how to prepare and use ICT competently, vigilant attention is given to pre-service training for newly appointed teachers before joining the regular classes to acquaint them with the important role of technology in school settings were critical indicators for collaborative learning.

From Table 3 the coefficient of determination is 0.573 It shows that 57.3% of variation in Collaborative learning in Basic Education is accounted for by Indicators of ICT Integration. Analysis of Variance was done to establish the level of significance (Table 4).

**Table 4: Analysis of Variance of Indicators of ICT Integration on collaborative learning in Basic Education**

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 269.625 | 8 | 33.703 | 76.228 | .000b |
| Residual | 201.172 | 455 | .442 | | |
| Total | 470.797 | 463 | | | |

*a. Dependent Variable: collaborative Learning*

*b. Predictors: (Constant), Teachers improve their performance by learning from other teachers through digital devices, Vigilant attention is given to in-service teacher training for both teachers and heads of institution s, If teachers and learners are made aware of the importance of Portable Technology Integration in the classroom, more teachers and learners will be willing to use the Portable Technologies, In-service teacher training is given to teachers on how to prepare and use ICT competently, There is a clear institutional policy regarding the use of ICT in my school., Adequate support is provided by administration for Every classroom teacher to use learning technologies to enhance their learners' learning in every subject, Vigilant attention is given to pre-service on how to prepare and use ICT competently, Vigilant attention is given to pre-service training for newly appointed teachers before joining the regular classes to acquaint them with the important role of technology in school settings*

From Table 4 the level of significance was 0.000 which was less than the set p-value of 0.05. This meant that indicators of ICT integration were predictors of Collaborative learning in Basic Education.

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To determine the influence of Indicators of ICT Integration on Collaborative learning in Basic Education multiple regression analysis was done and the results were as shown in Table 5.

**TABLE 5: RESULTS OF REGRESSION ANALYSIS BETWEEN INDICATORS OF ICT INTEGRATION ON COLLABORATIVE LEARNING IN BASIC EDUCATION**

| | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | .392 | .128 | | 3.058 | .002 |
| There is a clear institutional policy regarding the use of ICT in my school X1. | .103 | .034 | .123 | 3.005 | .003 |
| Adequate support is provided by administration for Every classroom teacher to use learning technologies to enhance their learners' learning in every subject X2 | .148 | .034 | .188 | 4.371 | .000 |
| Vigilant attention is given to in-service teacher training for both teachers and heads of institutions X3 | .017 | .034 | .022 | .511 | .610 |
| Vigilant attention is given to pre-service training for newly appointed teachers before joining the regular classes to acquaint them with the important role of technology in school settings X4 | .070 | .045 | .084 | 1.578 | .115 |
| Vigilant attention is given to pre-service on how to prepare and use ICT competently X5 | .061 | .039 | .076 | 1.577 | .115 |
| If teachers and learners are made aware of the importance of Portable Technology Integration in the classroom, more teachers and learners will be willing to use the Portable TechnologiesX6 | .087 | .030 | .102 | 2.929 | .004 |
| In-service teacher training is given to teachers on how to prepare and use ICT competentlyX7 | .130 | .028 | .171 | 4.714 | .000 |
| Teachers improve their performance by learning from other teachers through digital devices X8 | .259 | .032 | .312 | 8.087 | .000 |

a. Dependent Variable: collaborative Learning

Collaborative learning = 0.392+.103 X1+ .148 X2 +.187 X6+.130 X7+.259X8

A multiple regression was calculated to predict Collaborative learning based on Indicators ICT integration.

The finding from table 5 indicates that a clear institutional policy regarding the use of ICT in school, adequate support provided by administration for every classroom teacher to use learning technologies to enhance their learners' learning in every subject, In-service teacher training is given to teachers on how to prepare and use ICT competently , teachers improve their performance by learning from other teachers through digital devices and if teachers and learners are made aware of the importance of portable technology integration in the classroom contribute positively to collaborative learning.

The finding show that one can measure collaborative learning by substituting in the formula for Indicators of ICT Integration as follows.

Collaborative learning = 0.392+.103 X1+ .148 X2 +.187 X6+.130 X7+.259X8.

Collaborative learning = 0.392+.103 *5+ .148 *5 +.187 *5+.130 *5+.259*5.

= 4.527

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If all conditions are perfect, then Collaborative learning will be rated 4.432 out of maximum rating of 5. This will translate into 90.54%.

The lowest rating

Collaborative learning= 0.392+0.103*1+0.148*1+0.187*1+0.13*1+0.259*1

= 1.219

The worst case scenario, then Collaborative learning will be rated 1.219 out of maximum rating of 5. This will translate into 24.38%. It can also be presented as follows. The scale is presented in Figure 2.

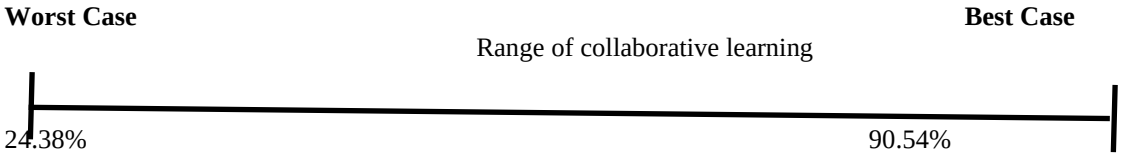
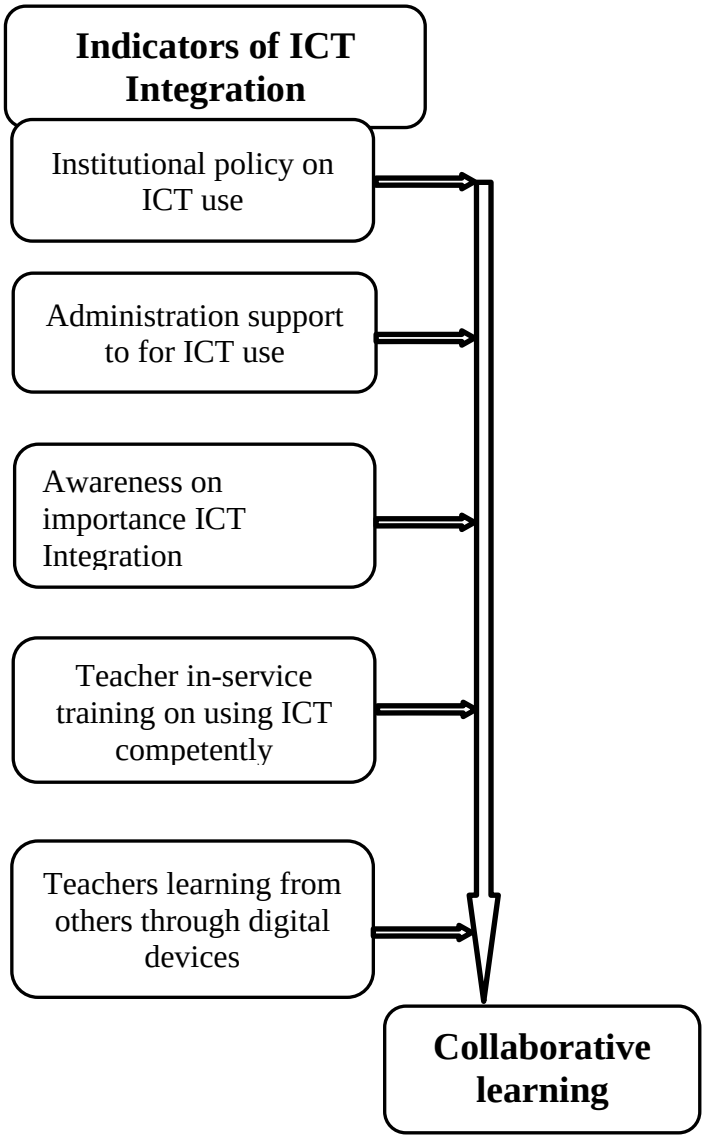



**Fig 2: Scale of Indicators of ICT Integration for Collaborative Learning l.**
**Source: Research 2019**

**III ICT integration framework for collaborative learning (IIFCL**



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The IIFCL framework so developed with regard to Indicators of ICT integration for collaborative learning in most Institutions, it was established that Majority of the teachers were not aware of the existence of the ICT policy. There is need for ICT institutional policy to be institutionalized in every institution to guide ICT integration for collaborative learning. For the policy to be operationalized then there is need for administration support to use learning technologies. Adequate supervision support provided by administration is essential to enable teachers integrate ICT in teaching-learning.

In most Institutions, there was no pre-service training for newly appointed teachers before joining the regular classes to acquaint them with the important role of technology in school settings, no pre-service on how to prepare and use ICT tools competently. It was observed that if teachers and learners are made aware of the importance of portable technology integration in the classroom, more teachers and learners would be willing to use the portable technologies since teachers improve their performance by learning from other teachers through digital devices.

## II. CONCLUSION

The study established that 57.3% of variation in Collaborative learning in Basic Education is accounted for by Indicators of ICT integration. Clear institutional policy regarding the use of ICT in school, adequate support provided by administration for Every classroom teacher to use learning technologies to enhance their learners' learning in every subject, in-service teacher training given to teachers on how to prepare and use ICT competently , teachers learning from other teachers through digital devices and teachers and learners being made aware of the importance of portable technology integration in the classroom contribute positively to collaborative learning.

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