



# 2<sup>ND</sup> International Annual October Conference on Education and Lifelong Learning 2015

“Post 2015 Development Agenda:  
Moving Education Forward”

**CONFERENCE PROCEEDINGS / WORKING PAPERS / VOLUME ONE**



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# SCHOOL OF EDUCATION FUNDAMENTAL STATEMENTS

## **Vision Statement**

To be a globally competitive hub of education development  
professionalization of educators, educationalists, researchers and mentors

## **Mission Statement**

To provide exemplary leadership in transformative skill-based education  
services founded on quality teaching and learning, research, innovation,  
and life-long community service

## **Philosophy**

Quality education for the service of humanity

## **Core Values**

Honesty, respect, integrity, team spirit, democracy, inclusivity, transparency  
and accountability

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## MESSAGE FROM CONFERENCE CHAIR

The School of Education, Kenyatta University successfully hosted the 2nd International Annual Conference on Education and Lifelong Learning at Kenyatta University, on 8th-9th October 2015, dubbed “*the KU October Conference on Education*”. The conference was graced by renowned educationalists, namely, Dr. Evangeline Njoka (Chief Guest Speaker and First Chief Executive Officer of the Kenya National Commission for UNESCO); Prof. Kabiru Kinyanjui (Keynote speaker and International Development and Education consultant); Prof. Alemayehu Bishaw (Keynote Speaker and Associate Professor, Dean Graduate Studies, Bahir Dar University, Ethiopia); Dr. John Mugo (Guest Speaker and Director, Data and Voice, Uwezo, East Africa) and Dr. Hellen Amunga (Host Speaker and Lecturer, Department of Educational Communication and Technology, Kenyatta University). These high profile speakers provided the framework for thematic discussions guided by expertise, experience and knowledge in education and the various thematic areas of the conference.

The conference was organised to fall in October, which is the month the World Teachers’ Day (October 5) is celebrated globally. The conference theme titled, “*Post 2015 Development Agenda: Moving Education Forward*” helped to accommodate a variety of relevant sub-themes that allowed the authors to address salient concerns in education in context of accomplishments of the Millennium Development Goals (MDGs) and recasted in the era of Post 2015 Sustainable Development Goals (SDGs). The sub-themes covered in this issue focus on educational processes including pedagogy, curriculum development, use of technology and innovation, equity and inclusiveness, educational management and transformation, as well as planning for the overall quality of education. In this context, the conference was able to pursue its core objective of providing a structured platform via which education scholars, policy makers, practitioners, and students disseminate and share knowledge generated through research in the field of education under the chosen broad theme.

Being a relatively young conference that was launched on 31st October 2014, it is indeed a great pleasure to witness the fruition of this publication which adds value to our October Conference which, without doubt, enhances the mandate of disseminating evidence-based knowledge, elicit wider feedback from readers and motivate further discussions and research on topical educational issues. This publication goes a long way to strengthen the processes of conferencing beyond the event of the conference *per se*. I therefore take this opportunity, on behalf of the Conference Committee and on my own behalf, to wish you meaningful and enjoyable readership and welcome you to the forthcoming Annual October Conference.



**Prof. Fatuma Chege**

Chairperson, Conference Organising Committee &  
Dean, School of Education, Kenyatta University

January 2016

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# CONFERENCE PROGRAMME

**2nd International Conference on Education and Lifelong Learning**  
**8th -9th October 2015**  
**School of education, Kenyatta University**

**THEME: POST-2015 DEVELOPMENT AGENDA: MOVING EDUCATION FORWARD**

**Sub-themes:**

1. Education and Emerging Issues
2. Research in Education Policy and Planning
3. ICT, Virtual Learning Technology in Education
4. Quality Education and Transformative Leadership
5. Education and Equity, Gender, Culture and Marginalisation
6. Teaching in Diversity and the Teaching Profession

# THE IRONY OF PHYSICS TEACHERS' COMPETENCE IN ICT INTEGRATION IN CLASSROOM INSTRUCTION IN NAIROBI COUNTY KENYA

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## Abstract

Knowledge in Physics is vital in achieving Vision 2030 objectives, yet the subject has often registered low enrolment and performance at the Kenya Certificate of Secondary Education (KCSE). Research shows that integration of ICT in Physics instruction has the capability of simplifying the abstract content as well as creating interest in learners. However, this is only possible when teachers can use ICT in classroom instruction. This study sought to find out Physics teachers' competence in ICT use for classroom instruction. The objectives of the study were to find out Physics teachers' level of training in the use of ICT in classroom instruction, assess the adequacy of the Physics teachers' training in the use of ICT in classroom instruction and to find out the Physics teachers' frequency of use ICT in classroom instruction. This study was conducted in Nairobi County and targeted 40 schools, 40 principals and 121 Physics teachers. It was guided by the Unified Theory of Acceptance and Use of Technology (UTAUT) model. Descriptive survey research design was used. Random sampling technique was used to get a sample of 18 schools and 52 Physics teachers whereas purposive sampling was used to get 18 principals. Questionnaires, interview schedules and an observation schedule were used to collect data. The study found that integration of ICT in Physics instruction in secondary schools in Nairobi County is still very low. The study recommends more requisite integration skills to be given to Physics teachers in the county.

**Key Words:** Classroom, Competence, Confidence, ICT, Instruction, Integration, Physics, Teachers

## Introduction

Physics contributes to technology related infrastructure and provides trained workforce necessary to support invention towards scientific progress. The adoption of science, technology and innovation is critical towards attaining Kenya's Vision 2030 target of raising productivity and efficiency across various sectors of the economy. The Kenya Institute of Education (KIE) guideline of 2002 envisages access to education as a gateway to skills, new attitudes and opportunities (KIE, 2002). Learning physics provides a foundation for technological and industrial development to tackle critical development challenges towards socio-economic transformation.

Globally, studies in pedagogy show that there is a general decline in popularity and interest in natural sciences and technologies especially learning physics (Jarosievitz, 2012). In Africa, the motivation for learning and examination results is on the decline (Garwin and Ramsier, 2003). In Kenya, the enrolment in physics stands below 50 per cent and performance is below average compared to other subjects (Musyoka, 2004; Semela, 2010; Amadalo, Ocholla and Memba, 2012). Learners perform poorly in a subject when their expectations and motivation is low (Muteti, 2009).

## Statement of the Problem

Physics is one of the key subjects that learners need to embrace in this technological age. However, the subject remains unpopular among many learners who find the subject difficult, theoretical and uninteresting due to its perceived abstract nature (House of Lords, 2006; Adeyemo, 2012; Hirschfeld, 2012). This raises the need to use ICT in making learning physics simple and interesting. This will not only enhance learners performance in Physics, but also enable them acquire relevant knowledge and skills to support attainment of Vision 2030 targets and further Kenya's development (Jarosievitz, 2012). The use of Information and Communication Technology (ICT) is largely depended on Physics applications, such as transistors in computers and mobile phones, photons and quantum in fiber optic and electromagnetism in generation of electricity. Studies done in controlled conditions show that ICT use under the right circumstances improves outcomes in education and many educationalists advocate for

a new pedagogy that integrates ICT in preparing students for work in this information age (Gulbahar and Guven, 2008).

The government of Kenya has put in place policies to guide integration of ICT in classroom instruction, improved infrastructure and the Kenya Institute of Curriculum Development (KICD) is developing digital content to be used in schools. However, the decision regarding whether or not to use ICT rests with the teachers.

Teachers have a key role to play and determine the success of any innovation such as use of ICT in classroom instructions. Therefore, teachers' acceptance to use ICT is indispensable for its integration in classroom instruction. This will only be possible when teachers have the required competency in ICT. Therefore, this study sought to find out Physics teachers' competence with ICT and readiness to integrate ICT in classroom instruction.

## Objectives of the Study

1. To determine the nature of Physics teachers' training in the use of ICT in classroom instruction
2. To assess the adequacy of the physics teachers' training in the use of ICT in classroom instruction
3. To determine the competency of Physics teacher in the use of ICT in classroom instruction
4. To determine the frequency with which Physics teachers use ICT in classroom instruction

## Research Questions

1. What are the Physics teachers' training levels in the use of ICT in classroom instruction?
2. Is the training of the physics teachers in the use of ICT in classroom instruction adequate?
3. What are the Physics teachers' competency levels in the use of ICT in classroom instruction?
4. What are the Physics teachers' confidence levels in the use of ICT in classroom instruction?

5. What is the frequency of use of ICT in classroom instruction by the Physics teachers as a result of their competence?

## Research Methodology

Descriptive survey design was adopted to answer research questions for this study, which required primary data from Physics teachers and principals as regards the Physics teachers' competence. The information gathered from Physics teachers and principals was used to describe, analyze and interpret Physics teachers' competence, hence descriptive survey design was appropriate.

The study was done in Nairobi County. It targeted 40 secondary schools that had been supplied with some ICT resources (laptops, LASs, desktop computers and overhead projector) under the Economic Stimulus Programme (ESP), 40 principals in the respective schools and 121 physics teachers. Simple random sampling technique was used to get a sample of 18 schools and 52 Physics teachers whereas purposive sampling was used to get 18 principals. This is due to the homogeneity of the study population considering that the schools were beneficiaries of ESP hence they were expected to have similar ICT environment, including teachers who are public servants. Questionnaires, interview guides and observation schedules were used to collect data. Validity and reliability of the study instruments were established through consultation with ICT experts at KICD. The quantitative data was analyzed using descriptive statistics generated from SPSS version 21. The interpreted data was discussed, inferences were made and a report written.

## Study Findings

This study sought to examine the competence of Physics teachers in integrating ICT in classroom instruction. Computer literacy is a prerequisite to ICT competency. The findings indicated that about 94 per cent of physics teachers were computer literate while only 6 per cent had limited basic computer knowledge in computer applications. This is a relatively a good sign of progress towards digital era and integration of ICT among teachers. The percentage of Physics teachers with computer literacy in this study was higher compared to that in a study by Mwingirwa (2012) in Tigania East, whereby about 67 per cent of the mathematics teachers had some

form of training to use ICT while about 33 per cent had no training related to ICT. This could be because Tigania is located in a rural setting while Nairobi is an urban area, the capital city of Kenya. Thus, teachers in Nairobi are more likely to easily access and use technology through many available computer colleges and cyber cafes that offer computer services, unlike in Tigania. This could also be due to the three years intervening period between the two studies indicating an improvement in access to ICT and computer literacy amongst teachers. It was also a good indication that teachers are keen on computer literacy and hopefully integration into classroom instruction.

The big number of computer literate teachers in the schools was a good starting point since computer literacy is a prerequisite to ICT competence, which eventually leads to ICT integration in classroom instruction. This is because it is not possible for a teacher to integrate ICT in classroom instruction without being computer literate. Arunga (2011), Acker *et al.* (2011) and Smaldino *et al.* (2005) affirm that computer literacy is obligatory to enable any teacher to accomplish ICT integration in any given subject. When teachers are computer illiterate, most of the time is likely to be spent in 'learning the technology rather than using the technology'.

Physics teachers indicated their computer literacy level certifications. About 56 per cent had a certificates obtained from computer colleges and 33 per cent had no certification but reported to be computer literate through 'learning by using' or 'hands on', moreover, about 11 per cent had obtained a diploma in computer, meaning that their computer know how was beyond literacy. However, none of the teachers had a degree in ICT. The findings of this study regarding literacy certification were in agreement with studies by Mwingirwa, (2012) and Migwi, (2009) whereby majority of the teachers had certificates in computer literacy. Certificate level of certification is much basic meaning that as much as majority of the Physics teachers were computer literate, their literacy levels were very basic, and hence more training was required to increase their competence levels to enable them comfortable use ICT in classroom instruction.

Further, Physics teachers were asked whether they had undergone any specific formal training on how to use ICT in classroom instruction or not.

As much as computer literacy is a prerequisite to ICT integration, it is not adequate since a teacher requires more training to integrate ICT effectively in classroom instruction. About 72 per cent of the teachers had some form of formal training while 28 per cent had received no formal training.

The findings on formal training on how to use ICT were in contrast to Migwi's (2009) study, whereby only 9 per cent of the teachers had received specific formal training on how to use ICT in instruction, while the rest 91 per cent had not received any training. In comparison to Migwi's findings, there is improvement in terms of the number of teachers with specific formal training in ICT in Nairobi County. This could be attributed to the elapsed time between Migwi's study and the current study. On the other hand, this improvement can also be attributed to the location of the study, considering that Nairobi is the capital city of Kenya, where ICT resources and colleges would be more easily accessed.

The Physics teachers' formal trainings were done by different institutions. The Kenya Institute of Curriculum Development (KICD) ICT Champion programme trained the highest number of the Physics teachers (55 per cent). Strengthening of Mathematics and Science in Secondary Education (SMASSE) seminars/ workshops trained 27 per cent while the District Quality Assurance Officers (DQASO) trained 6 per cent. It was noted that the training for Physics teachers was not uniform. Hence the standard, uniformity and quality of each of the trainings could not be established since they were organized and conducted independently.

Regarding the adequacy of the different trainings, half of the Physics teachers (50 per cent) felt the training was not adequate while 28 per cent of them agreed that the training was adequate, most of whom were ICT champions trained by KICD so that they train fellow teachers. The rest of Physics teachers would not judge the quality of the training since they had not received any formal training. The number of teachers who felt that the training was not adequate (50 per cent) and those who could not comment due to lack of training was relatively high. This shows that the model of training trainer of trainers (TOT), referred to as ICT champions by KICD, was not effective as the Champions were in most cases not able to reach out to fellow teachers due to lack of structures to enable them train fellow colleagues.

Competence leads to confidence in using any innovation. Very few teachers were confident with the use of ICT in classroom instruction due to lack of competence in the required skills and were using ICT on limited basis. The teachers who attempted to use ICT felt that it was their hard work, and not the training, that made them use ICT in classroom instruction. However, they used the simpler application software like Microsoft Word, Powerpoint and use of a projector and avoided more difficult software (like mind mapping, video editing, e-lecture making, photo editing, hot potatoes, screen casting, and voice threads) which would be more appropriate for learner centered mode of instruction.

In support of inadequate training of teachers, Arunga (2011) contends that few teachers in East Africa have the knowledge to teach their subject content using ICT because they have not been adequately trained to do so. Mungai (2012) asserts that there exists inadequate preparation opportunities for teachers on ICT integration globally.

Forty four per cent of the teachers cited lack of refresher courses while 38 per cent cited short time of training as reasons for inadequate training. Further, Physics teachers responded to whether they had ever attended any ICT related refresher course or not. Only 33 per cent of the teachers indicated having ever attended a refresher course. The rest of the teachers (77 per cent) had never attended any refresher course, hence confirming the finding that lack of refresher courses was a major reason for the teachers finding the training inadequate. Even those who felt competent suggested continuous refresher courses to be conducted so as to upgrade teachers' skills. The teachers in Sim and Theng's (2008) study also suggested that school-based professional development and ICT seminars/ conferences are important avenues for improving teachers' ICT skills, which were limited in the Nairobi County scenario.

Glazer and Hannafin (2006) and Muijs and Lindsay (2008) argue that one-off trainings are ineffective because the teacher does not master the skill well, and therefore lacks confidence to use ICT on his/her own in the classroom. Tinio (2002) adds that even the most comfortable teachers in ICT, need to upgrade their skills continuously and be well informed of new developments and best practices. The Nairobi County teachers share these sentiments. Attendance of refresher courses

is very important because technology keeps evolving and Physics teachers cannot rely on old knowledge and skills when a new software or hardware comes to the market. Swarts (2008) also supports this assertion by saying that ICT Teacher Professional Development (TPD) should be ongoing and should be as flexible as possible because it imparts the teacher with the necessary skills and confidence to enable him/her to use ICT.

The teachers specified their level of competence in using various ICT applications after the training. Apart from internet use in which only 44 per cent were highly competent, most teachers were just fairly competent in various competencies /skills like use of Microsoft office, email, other digital softwares, digital content, solving minor ICT problems and use of ICT in classroom instruction of Physics. There were also some teachers not competent at all in the basic skills. This means that as much as majority of the teachers (94 per cent) had indicated that they were computer literate, and 72 per cent had received some formal training on how to use ICT in classroom instruction, the teachers' competence levels in the various skills they were required to have was still low. This confirmed their feeling that the training was not adequate.

On the level of confidence to use ICT in classroom instruction, about 83 per cent of the teachers were just fairly confident, 11 per cent were not confident at all while only 6 per cent of Physics teachers were highly confident. It was noted that as much as the teachers had been trained, they still felt that the training was insufficient and this led to their low level of competence and hence low confidence in the use of ICT in their classroom teaching. Fifty per cent cited that the training was not adequate whereas 22 per cent of them had not been trained at all. Therefore, this calls for more training and refresher courses.

A study in Cyprus by Chrysostomou and Mousoulides (2009) and that by the Ministry of Education and Training [MET] (2005) in Western Australia established that the teachers' level of ICT competence and their attendance of training on how to integrate ICT were the most influential factors on the teachers' integration of ICT in the classroom. The teachers' attitudes will be positive towards the use of ICT if they feel confident with the training that they have attained and hence they will have confidence in delivering the subject content through use of ICT in the classroom.

Further, Physics teachers responded to how frequently they used some common ICT applications like Microsoft Word for either typing their records or notes, Microsoft excel for calculating students' marks, PowerPoint for class presentations, emails for collaborating with other teachers from other schools and internet for searching relevant digital teaching content. It emerged from their responses that majority of them rarely used the applications and those that used them, used them only when it was necessary.

Majority of the Physics teachers used different ICT applications either rarely or when necessary and this could be attributed to lack of competence. This finding is supported by a study conducted in Vietnam by Dang (2011), which showed that teachers who use ICT in instruction only concentrated on the software programs they perceived to be easy and shied away from those perceived to be difficult.

Fifty per cent of the teachers rarely used ICT in classroom instruction, 22 per cent used ICT often, 17 per cent used when necessary, 11 per cent never used at all, while none of the teachers 'always' used ICT in classroom instruction of Physics. Therefore, as much as a large number of Physics teachers (94 per cent) in Nairobi County are computer literate, and 72 per cent have had at least some form of formal training in the use ICT for classroom instruction, the findings show that integration of ICT in classroom teaching is still very low.

This could be due to lack of confidence and competence that result from inadequate training and lack of refresher courses as was indicated by the teachers. This finding is in line with a study by Mwingirwa (2012) in Tigania, whereby the teachers who had no form of ICT training did not use ICT at all. However, in both Mwingirwa's study and the current study, the teachers had a desire to be more trained on ICT use for classroom instruction.

There should be emphasis on training of teachers in Nairobi County on ICT skills and teachers be encouraged to attend continuous development courses related to ICT as well as comprehensive in-service seminars for refresher courses to enable them fully implement ICT in classroom instruction. The Koech Report of 1999 on Total Quality Education Training (TQET) supports this thinking. The Report further explains that teacher education needs to be revised especially on emerging issues such as information and

technology. On the other hand, Awan's (2011) study demonstrated that the training needs of teachers in ICT cannot be over-looked when developing initiatives aimed at changing teaching and learning practices in schools and classrooms. Therefore, training programmes should be able to assist teachers on how to achieve specific educational objectives through ICT in teaching of Physics in Nairobi County.

## Conclusion

Majority of Physics teachers in Nairobi County were computer literate and had attended at least some form of formal training to gain ICT skills to use ICT in classroom instruction. The formal training was conducted by different institutions therefore, uniformity, scope and quality of the training was not guaranteed. As a result, majority cited that the training was not adequate and hence majority were just fairly competent in various ICT skills and fairly confident to use ICT in classroom instruction. As a result, the frequency of use of ICT in classroom instruction of Physics was low, majority rarely or never used ICT in classroom instruction and none used ICT

always. Therefore, ICT integration in classroom instruction by Physics teachers was still very low in Nairobi County secondary schools possibly because of the inadequate training and lack of frequent refresher courses as indicated by more than half of the physics teachers.

## Recommendations

1. All teacher-training institutions should introduce ICT in their curriculum so that the teacher trainees leave the institutions when they have already acquired relevant ICT knowledge and skills to integrate ICT in classroom instruction, this will ensure uniformity and quality of training.
2. The Ministry of Education, Science and Technology should introduce frequent in-service refresher courses to help keep Physics teachers up-to-date with emerging new ICT skills and hence establish competence and confidence in the teachers in the field to use ICT in classroom instruction.
3. The training to be planned centrally to ensure quality and uniformity.

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