

Factors Influencing the Effective Use of ICT in Teaching and Learning Science Curriculum in Kenyan Secondary Schools: The Case of Cyber and Nepad e- Schools

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Abstract

This study set out to investigate the factors that influence the use of Information and Communication Technology (ICT) in the curriculum designed for teaching and learning science in Kenyan secondary schools. The sample for this investigation was drawn from Cyber Schools Technology Solution (CSTS) and New Partnership for Africa Development (NEPAD) e-Schools in Kenya. It is pertinent to note that educational systems worldwide are vigorously pursuing the integration of ICT as a means of keeping abreast with the rapid technological changes associated with a knowledge-based economy. The education system in Kenya is no exception to these emerging pedagogical changes, which have subsequently prompted the government to introduce several e-initiatives related to the integration of ICT in learning and teaching. In spite of massive spending on education by the Government of Kenya, there is a serious and widening gap between current schooling outcomes and the skills required for effective participation in global workplaces. The reality in the classroom falls short of the aspirations of those advocating for the use of ICT in teaching and learning in schools especially in NEPAD e-schools and Cyber e-schools. A considerable amount of research has been undertaken to investigate the impact of ICT on society as a whole and on educational systems in particular. However, these investigations have generally been confined to Western contexts. In view of this bias, this study sought to investigate the impact of the school environment in the integration of ICT, access to ICT infrastructure, teachers' and learners' training in ICT skills and the role of infrastructure providers New Partnership for Africa Development (NEPAD and Cyber School Technology Solutions Limited (CSTS) in secondary e-schools in Kenya. The primary objective was to examine the ways in which ICT integration has impacted on the teaching and learning of science subjects as well as to establish the current level of ICT integration. This was carried out in order to determine factors that influence its effective use in teaching and learning science subjects. A descriptive survey was employed using an ex-post facto design. This entailed collecting data using a mixed mode approach, involving a combination of qualitative and quantitative techniques. The investigation was conducted in twelve secondary schools which were located in the eight provinces of Kenya. Six of the schools sampled are currently participating in the Cyber School Technology Solution ICT programme, while the remaining schools are NEPAD e-school demonstration schools in Kenya. Two standard questionnaires were distributed to a total of 1247 students and 44 teachers. The data elicitation techniques consisted mainly of interviews, observations, site visits and analysis of documents relating to the mentioned programmes. The findings of this investigation were that learners and teachers in both NEPAD and Cyber e-schools were not adequately trained on the use of ICT in the teaching and learning science

subjects. Training in basic technical ICT skills was also found to be inadequate. This is primarily due to the fact that the existing pedagogy, as well as the existing information resources in NEP AD and Cyber e-schools do not support the effective use of ICT in teaching science subjects. Moreover, the investigation established that even in cases where teachers had received some ICT training, not much time was allocated for the teachers to apply and implement the ICT skills they had gained into their teaching methodology. The teachers also lacked pertinent information and skills necessary to enable them to access relevant scientific information from the Internet. A further hindrance was caused by the poor Internet connectivity in a number of e-schools, whereas others lacked Internet connection all together. Furthermore, most schools did not have the required multimedia equipment. High costs were also observed to be an inhibiting factor in integrating ICT into the science teaching and learning curriculum in the NEPAD and Cyber e-schools. Based on these findings, the ICT projects in schools will be unsustainable if the cost factor is not reviewed and resolved. Other factors that had a significant influence on the use of ICT integration in teaching and learning science subjects included technical and pedagogical ICT-competence, attendance at ICT -related professional development courses, location of the schools, availability of computer laboratories and access to Internet services and power supply. In addition, the number of working computers, availability of file servers, students computer sharing ratio, ICT skills, duration of ICT training, and pedagogical skills were also significantly and positively correlated to the use of ICT in teaching and learning science subjects. Of all the personal characteristics of science teachers, pedagogical ICT -skills were observed to be the best positive predictor of the teachers' pedagogical adoption of ICT. This research finding triangulated well with the observation that teachers were more willing to attend pedagogical than technical professional-development activities with regard to the use of ICT. The conclusion of this investigation is that the use of ICT in teaching science subjects at both NEP AD and Cyber e-schools has had a limited impact on science education in the schools. This is mainly because teachers in these schools did not have time outside their normal working schedules and the necessary technical skills to repair non-functional computers. In a number of cases, there was no Internet connection and the support provided from the school administration as well as from the ICT infrastructure providers (NEP AD and CSTS) was minimal. Nevertheless, modem insights into the use of ICT in science education were gained and new approaches to science education developed in the e-schools, some of which provided new challenges in teaching methodology. Furthermore, both the teachers and learners attempted to utilize a few emerging methods for teaching subjects during the NEP AD and Cyber e-schools projects. This study recommends that teachers and learners need to be supported through face-to face training in the ICT skills necessary for teaching and learning. This will enable them to develop the required confidence needed to integrate ICT skills in a classroom environment. In this respect, this study recommends the development of a National ICT training strategy for them. It is also pertinent that accessibility to good quality ICT infrastructure is developed to enable teachers enrol for online distance courses in ICT integration in learning and teaching science subjects. Moreover, a National policy on refurbished computers will be necessary to avoid the dumping of obsolete computers into

schools. Finally, clear policy guidelines are required to guide the strategic incorporation of ICT into the teaching and learning curricula used in Kenyan schools.

Key words: Information Communication Technology, Secondary Schools, Kenya

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