Factors Affecting the Integration of Educational Technology in Classroom Instruction in Secondary Schools in Kenya

Dr. Edwin Masibo
Department of Curriculum and Instructional Technology
Kibabii University, Kenya

1.0 Introduction

The beneficial effect of improvement gains in learners’ attitudes and performance in classroom instruction when learning is supported by relevant technology points to the need for teachers to integrate the said technology resources in their classroom instruction to enable their learners to tap on the potential of technology to enhance mastery of concepts. This study targeted four hundred and seventy eight (478) secondary school teachers of mathematics in Bungoma County. The objective of the study was to determine the factors that affect the integration of technology in classroom instruction. The sample for the study was two hundred and ninety eight (298) secondary school teachers of mathematics who attended the SMASSE In-Set training at the four in-set centers in the County. Data was collected using a questionnaire that captured the responses from the teachers on the factors that affect the integration of technology in instruction and the severity of the identified factors in affecting instruction. The respondents were categorized according their beliefs about Mathematics as espoused by Ernest (1988) thus, the Platonists, the Problem Solvers and the Instrumentalists. This was in view of the fact that teachers’ beliefs have been found out to impact on the nature of classroom instruction. Data was analyzed using descriptive statistics involving the use of means, frequencies and percentages. The finding of the study was that the teachers of mathematics cited a number of factors as responsible for the status of the integration of technology in classroom instruction. It was observed that since mathematics is a core subject in the school curriculum and has much bearing in novel technologies that are prevalent at the market work environment, meaningful reforms should be done to see more integration of technology to enhance effectiveness of instruction in ways that seek to improve the standards of education in the country in line with the Vision 2030, which is the platform for meaningful national development.
2.0 Methodology
The teacher-respondents were required to rank in order of severity a set of six likely factors affecting the integration of new technology in their instructional programmes. The most severe was to be ranked as 1 while the least severe was to be ranked 6. The following six statements were the ones to be ranked by the respondents.

1. Inadequate technology related resource materials
2. Lack of teacher preparedness to use the technology in instruction
3. Heavy curriculum demands that do not match the required technology usage
4. Lack of administrative support to acquire the requisite technology
5. Lack of proper policy guidelines on acquisition utilization and management of the technology in line with the existing instructional programmes
6. Lack of congruence between technology utilization in instruction and in national examinations

From the responses of the teacher-respondents on each factor across the three belief categories, it is evident that there is a considerable variance on rating the severity of the factors that affect the integration of new technology in mathematics instruction. Among the Platonists, the most severe factor that affected the integration of new technology in classroom mathematics instruction is lack of administrative support to acquire the requisite technology, this was followed closely by the heavy curriculum demands that do not match the required new technology usage, lack of teacher preparedness to use the new technology in instruction, inadequate technology related resource materials, lack of proper policy guidelines on acquisition, utilization and management of technology in line with the existing instructional programmes in schools and the least severe factor being the lack of congruence between technology utilization in instruction and in testing and evaluation in national examinations. Teachers in this belief category assume the explainers role with the view of developing conceptual understanding of mathematics concepts so that students develop a unified body of mathematics knowledge. Therefore, the teachers have keen interest in integrating new technology in their instructional programmes because of the perceived benefits that this will yield in the development of learners’ mastery of mathematics concepts. Therefore if they are supported by the supply of the requisite technology, they will engage learners more in learning with technology and therefore enhance the mastery of mathematical concepts.

Among the instrumentalists, the most severe factor that affected the utilization of technology in classroom mathematics instruction was the heavy curriculum workload that does not match the required new technology usage; this was followed by lack of teacher preparedness to use the technology, inadequate technology related resource materials, lack of congruence between technology utilization in instruction and in testing and evaluation in national examinations, lack of administrative support to acquire the requisite technology and finally, lack of policy guidelines on acquisition, utilization and management of the technology in classroom instructional programmes. Teachers subscribing to this belief hold the view of mathematics instruction that emphasizes strict adherence to rules, aimed at producing compliant behavior and mastery of computational skills in learners. They emphasize teacher-centered teaching approaches and view the integration of new technology as interference to the autonomy of the teacher in the instructional programme. Therefore, they would rather cover the heavy curriculum instrumentally than engage in technology integration strategy in the learning programme. These teachers also indicate that lack of teacher preparedness to use technology is a factor that contributes to the technology usage. This finding is in agreement with literature by Bigum (1990)
that indicated that lack of familiarity by teachers of how to promote instruction through the use of technology inhibits integration of technology in classroom instruction. The responses from the problem-solvers indicate that the most severe factor that affects the integration of new technology in classroom mathematics instruction is lack of technology related resource materials (software), followed by lack of administrative support to acquire the requisite technology, lack of teacher preparedness to use the technology in instruction, lack of policy guidelines in acquisition, utilization and management of the technology in classroom instruction in line with the existing instructional programmes in schools, heavy curriculum workloads that do not match the required technology usage and the least severe factor being lack of congruence between technology utilization in instruction and in testing and evaluation in national examinations. It is worth noting that teachers who subscribe to the Problem-Solving belief category assume the role of facilitators in the learning episode. They tend to empower their learners to engage in active construction of knowledge. Therefore, they are keen to incorporate a variety of technology in their instructional programmes. This they do with enthusiasm as it permits their learners to develop relational/conceptual understanding of concepts. This is the main goal of the instructional programme of teachers who subscribe to this belief category. Therefore, inadequacy of technology related resources is a big set-back to teachers who subscribe to this belief category. Similarly, lack of administrative support to acquire technology related resources affects the teachers’ integration of technology in classroom instruction. Taken cumulatively across the three belief categories, inadequate technology related resource materials was the most severe factor, followed by lack of teacher preparedness to use the technology in instruction, lack of administrative support to acquire the requisite technology, heavy curriculum demands that do not match the technology usage, the lack of policy guidelines on acquisition, utilization and management of technology in line with the existing instructional programmes in schools and lack of congruence between technology utilization in instruction and in testing and evaluation in national examinations. These findings are in agreement with literature by Collis (1988) that indicated that despite the realization that technology should be an integral part of the school curriculum at all levels, however, the integration of the very technology has proved to be slow and difficult than may have been expected. These findings are similar to research findings by Anderson (1997) and Taylor (1990) that indicated that school cultures influence teachers’ mathematical beliefs and practices. The two noted that it is true when a teacher holds a belief different from the school culture in which they work the teacher is then forced to compromise his belief. Literature by Anderson and Piazza (1996) and Doyle and Ponder (1997) similarly indicated that although administrators and supervisors may promote reform efforts, professional assessment may be in terms of the traditional paradigm and therefore, the teachers tend to conform to the status quo to minimize disturbance and professional risk in an ethical way. Similarly, the findings are in agreement with the findings by Bright (1994) who posited that pre-service teachers, upon entrance into their first mathematics methods course hold common beliefs that students should learn the basics first before or in addition to using technology, that technology can be used effectively during mathematics instruction, and that students should not rely on technology to find answers to mathematics problems. Bright (ibid) found out that most pre-service teachers seemed to be open to occasional or restricted technology use but also feared that the use of technology had potential to harm students’ computational skills. He found that the pre-service teachers were generally favourable to the use of computers during instruction but also cautioned that computer use should not replace traditional instruction and that students should not rely on computers. The reviewed literature indicates that there are incentives and barriers that may enhance the adoption of technology in some schools while effectively blocking wider acceptance in others. Among the identified factors in the reviewed literature
were; teachers’ self confidence in the use of technology, perceived relevance of the technology in instruction, teachers established pedagogical practices, staff development, access to resources and policy formulation. These factors taken cumulatively are in consonance with those identified in this study. Therefore, it is imperative that for the realization of the benefits of technology in mathematics instruction in secondary schools in Kenya, the teachers’ deeply held beliefs about the technology should be checked with the view of encouraging integration of educational technology in classroom instruction. The frequency distribution of the respondents in the rating of the severity of the factors that affect integration of new technology in mathematics instruction is presented in table 1.

Table 1: Severity of the Factors Affecting the Use of Technology in Classroom Instruction.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Platonists</th>
<th>Instrumentalists</th>
<th>Problem Solvers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate technology related resource materials</td>
<td>13</td>
<td>17</td>
<td>29</td>
</tr>
<tr>
<td>Lack of teacher preparedness to use the technology in instruction</td>
<td>15</td>
<td>19</td>
<td>24</td>
</tr>
<tr>
<td>Heavy curriculum demands that do not match the technology usage</td>
<td>16</td>
<td>22</td>
<td>14</td>
</tr>
<tr>
<td>Lack of administrative support to acquire the requisite technology</td>
<td>18</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td>Lack of proper policy guidelines on acquisition, utilization and management of technology in line with existing instructional programmes</td>
<td>12</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>Lack of congruence between technology utilization in instruction and evaluation in national examinations</td>
<td>10</td>
<td>15</td>
<td>11</td>
</tr>
</tbody>
</table>
From the table above, the factors that affect the integration of technology in classroom instruction were identified in order of severity starting with the most severe thus inadequate technology related resource materials was the most severe factor, followed in rank order by lack of teacher preparedness to use the technology in instruction, lack of administrative support to acquire the requisite technology, heavy curriculum demands that do not match the technology usage, the lack of policy guidelines on acquisition, utilization and management of technology in line with the existing instructional programmes in schools and lack of congruence between technology utilization in instruction and in testing and evaluation in national examinations. From these findings, it can be concluded that the teachers of mathematics hold different beliefs about the subject and what they consider the best approach for teaching the subject. There are those who strongly hold the traditional (instrumental) view of mathematics that is teacher-centered. The intent of their instruction is for learners to master skills and formulas. The teachers who hold this view about mathematics do not support increased exposure of learners to technology in mathematics instruction. They hold the view that the development of learners’ computational skills can be hindered by consistent exposure to technology. The teachers who hold the relational view of mathematics instruction seek to develop in their learners’ conceptual understanding of the subject. They structure their instruction in a manner that the learner actively constructs mathematical understanding. The curriculum is made learner-centered to capture the learner’s interest and needs. This approach facilitates the development of learners who are confident in problem solving and problem posing. The teachers who hold the relational view of mathematics instruction are keen to integrate new technology in their instructional programmes. They see the technology as an agent of making the instructional programmes more enriching and fulfilling in the development of learners’ conceptual understanding.

3.0 Conclusion

The following factors were identified as being responsible for the poor status of integration of technology in mathematics instruction. Inadequate technology related resource materials, lack of teacher preparedness to use technology in instruction due to the beliefs they hold about the use of technology in instruction, lack of administrative support to acquire the requisite technology, heavy curriculum demands that does not match the use of technology in instruction, lack of proper policy guidelines on acquisition, utilization and management of technology in line with existing instructional programmes in schools and lack of congruence between technology use in instruction and in testing and evaluation in national examinations. There is need to address these factors with the view of promoting technology compliant learning environments in schools and teacher training institutions.

The integration of technology in education and training institutions holds promise to bring many benefits to the learners and the teachers. Technology include, availing room for learner-centered instruction, greater opportunity for classroom interaction between teachers, learners, content and the technology, increased enthusiasm among learners in the learning of mathematics and improved achievement scores in examinations. These benefits in the learning process can only be realized if reform in mathematics education will target the teachers’ deeply held beliefs with the view of promoting beliefs that encourage the integration of technology in classroom instruction. This will help enhance education as a vehicle for attainment of the national vision 2030 that seeks to transform Kenya into a newly industrializing, middle income country providing a high quality life to all its citizens by the year 2030.
4.0 Recommendations

1. When responding to the questionnaire item on the factors that hinder the integration of new technology in classroom instructional programmes, the respondents indicated that the crowded curriculum denies them opportunity to meaningfully engage themselves in technology-rich instructional programmes. There is need therefore for identifying curriculum content that is manageable at a particular level and for learners’ career prospects and exposing the learners adequately to that content that will bring expertise that is useful for national development.

2. The government should mobilize both the public and private sectors to fund educational technology programmes in schools so as to create equity in the distribution of new technological resources. This will go a long way in bridging the gap between the different schools in diverse geographical and socio-economic backgrounds in terms of access to relevant technology and thus contribute to attainment of the global Sustainable Development Goals (SDGs) and the Vision 2030 in Kenya.

3. The Ministry of Education with support from development and other partners in the provision of education should re-establish and adequately fund a standards body that ensures supply of uniform, equitable and standardized technology equipment to all schools in the country. This will ensure that all schools are properly equipped with the relevant new technology that will support the intended e-learning programmes in all schools in Kenya.

4. School managers and administrators should support the establishment and development of educational technology resources in their institutions as means of enhancing provision of quality education and training in their schools. They should prioritize the acquisition and utilization of the resources in the school instructional programmes.

REFERENCES


