EDUCATIONAL TECHNOLOGY CONTENT DESIGN PREFERENCES FOR OUT-OF-SCHOOL TIME PRIMARY SCHOOL LEARNING

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Abstract: *This article follows a study that investigated the perceptions of primary schools stakeholders on the preferences of the best educational technology content design for primary school pupils. The study was conducted in Mwanza, Arusha and Dar es Salaam, involving some 11 best schools selected from each division of the involved districts. The study employed a multi case study design with quantitative approach. Initially, a preliminary study was carried out at a school in Arusha Region that deployed educational technology. The assumption was that the experiences of learners using educational technology would have enabled them to propose the features of educational technology presentation.. Their proposals formed the basis for extracting the items that were used in the questionnaire given to 92 learners, 78 parents, 39 Mathematics teachers, and 44 class teachers in the best 11 schools. The findings showed that the respondents preferred the use of explanations, cartoons, examples, songs, story-telling, practical works and questioning at the end of a lesson. They also mentioned drawings and teaching as general preferences for designing the content of an educational technology. However, some preferences received more support from respondents; and they included the use of practical works, questioning at the end of the lessons, examples, and explanations compared to use of cartoons, songs and storytelling. On the basis of these observations, it could be generally concluded that the presentation of the best educational technology should mainly incorporate practical works, questioning at the end of the lessons, use of examples as well as explanations. Thus, this article suggests that educational technology developers need to integrate the stakeholders' perceptions particularly the consideration of the features of educational technology; it should be practical-oriented; contextually relevant, affordable and it should make use of locally available resources.*

Key Words: *Educational Technology, Out-of-school time, educational technology content design, primary school learning.*

1. INTRODUCTION:

Educational technology is essentially a platform that allows enhancement of learning through the use of different digital tools aimed at improving instructional processes.[1] Educational technology is thus related to the application of specific techniques like 'educational television, radio, programmes and other audio-visual aids. Because of its pedagogical implications, educational technology needs to be contextually relevant as to enable learning to take place regardless of location and time. The Indianapolis Afterschool Coalition[2] posits that Out-of-School (OST) learning is the engagement of learners in school related activities outside school schedules such as before school, after school, during vacations and weekends. Ashleigh[3] finds that, some of the advantages associated with OST learning include cutting down the costs involved in the access of educational materials, cultivating the culture of independent learning, building morale for doing in-school assignments and enabling revision of school-related contents.

Educational technology in the educational system in general, and in OST in specific has been adopted in many parts of the World. For example, the American Government encourages educational bodies to instigate projects that foster application of educational technology in terms of OST. Ashleigh[3] mentions cases of such initiatives, which subsume the OST online systems like the Thirteen Ed Online, the Global Kids Online Leadership, and the TIME for Kids. On the one hand, the Thirteen Ed Online avail educators, parents, and learners with learning resources whereby educators receive lesson plans, online professional development and instructional tips. As for parents, the site gives information pertaining to child-care and parenting strategies; and learners receive assistance in doing home assignment, which may be in terms of videos with online educational material.

In Tanzania some institutions are at a lead in terms of championing OST technology integration. These include the Ubongo Kids Ltd, the Tanzania Broadcasting Corporation (TBC), UNESCO-China-Funds-in-Trust (CFIT) project for "Harnessing Technology for Quality Teacher Training in Africa", and XPRIZE Project for the Promotion of Early Learning through innovative technologies.[4-8] More initiatives on educational technology integration in Tanzanian include the ICT Implementation in Teachers' Colleges, ICT Development in Secondary Education, and the introduction of computer subject in the curriculum, and the e-School Forum. Other initiatives include the Tanzania Education Services Website, the Education Management Information System (EMIS), the Barclays Computer for Schools, the Computer Procurement and Refurbishment for Schools.[9] These initiatives offer a potential base for adoption of technology in the Tanzanian education system.

Magoma[10] finds that some 97.5% of Tanzanian children use televisions, 90.0% of them play video games while another 8% of them use the internet. The scholar further shows that some 42.5% of the Tanzanian children spend about two hours watching television, and some 28.1% of hem spend about two hours on the computer. This implies that Tanzanian children in general and primary school children in specific have some skills in the use of ICT in general. David[11] says that even though primary school children are never used to any digital technology, they can get used to it within limited time, provided they have access to the that technology. This is regardless of whether or not they are facilitated by conventional teachers. This is to say even Tanzanian children are capable of academic using television, computers and other digital media, given access to proper technology. However, the availability of contextually relevant educational technology is imperative if learners are to take full advantage of this technology-oriented century.

The use of contextually relevant and affordable educational technology is an important antidote to the scarcity of teaching and learning resources which has been a critical challenge in Tanzania primary and secondary schools. It has been shown that schools and teachers need to take actions to suppress the scarcity of instructional materials to facilitate effective learning. Mtahabwa[12] shows there are inadequate efforts by the educational authorities in relation to provision of good instructional materials. This calls for the need for schools to make pertinent efforts with a view to checking the deficiency of instructional materials. However, efforts will be more productive if they take into account the interests of main stakeholders in education i.e. learners, teachers, and parents. The intent of this paper was to determine the main features that are functional in designing contextually relevant content of educational technology for primary schools learning from the perspectives of stakeholders. This work is based on a Thesis submitted by the Author of this paper for the award of a doctoral degree of the University of Dodoma.[13] The Thesis developed a model to hasten technology integration for out-of-school time primary school learning.

2. LITERATURE REVIEW:

2.1 Analysis, Design, Implementation and Evaluation (ADDIE) Model

Educational technology design has been guided by different models that are contextually relevant. Although different models could be more applicable to different contexts, some useful ideas and practices could be borrowed and used in a way that could inform models in other different contexts. One of the relevant models is the analysis, Design, Implementation and Evaluation (ADDIE) Model. This was developed by the Centre for Educational Technology at the Florida State University.[14] The analysis of the programme has to do with investigation of the typical background of the potential user of the programme, which may include experiences and the status of required resources to contextually determine efficient and appropriate solutions[15-17]. On the other hand, the Design stage determines diverse forms of media and similar resources to be deployed alongside the level and nature of practices to be done. This stage also informs the time frame for each activity, and the diverse mental processes required by the participants in with a view to meeting the goals of the undertaking. Additionally, the design stage also specifies the plan on how the project will be disseminated to the end users.

Regarding the Development stage, it involves utilization of the data obtained from the two previous stages to formulate a programme which will serve the needs of the participants. Similarly, the Implementation stage reflects the continued use of the programme with maximum efficiency and positive results. The Evaluation is the stage in which the project is subjected to testing of the extent to which the intended objectives are achieved. This phase can be broken down into formative and summative evaluation. Whereas the formative phase is undertaken as students go on with studies, the summative portion is carried when the programme comes to end.

The emerging instructional initiatives in terms of technologies continuously change practices in education chiefly in the realm of lifelong learning as educational frameworks become increasingly responsive.[18] Instructional design entails a process of designing educational resources materials whereby technology plays a crucial role.[19] For example, the ADDIE model of instructional design generically offers organized procedures for developing educational materials, and serves as a blueprint that can be used in both traditional and modern technology practices[20]. Moreover, Summerville and Reid-Griffin[21] and Gökkaya and Güner[22] add that ADDIE involves strategies of technology integration, and it is broadly acknowledged as enhancing effective design of technology-driven instruction. Gökkaya and Güner[22] think that the ADDIE model is credible for designing the content of educational technology. On the other hand, LC Wakiki has been cited as an example of a technology-enabled training programme that is informed by the ADDIE model in the designing and developing e-learning contents.[22] In view of the aforesaid, the ADDIE model is definitely suitable for the development of a model that could be consulted when it comes to designing technology content.

2.2 ASSURE model

Another model which gained recognition in the world of instructional technology is what is abbreviated as ASSURE. This acronym represents six steps for integration of instructional technology in which case: A= Analyze learners, S = State objectives, S=Select technology tool, U= Utilize media and materials, R= Require learner participation, and E= Evaluate the technology tool in accordance with the intended objectives. Just like what obtains in the ADDIE, the ASSURE is a step by step design of instructional technology such that the output of one step serves as an input to the subsequent step.

With respect to the ASSURE model, the Analysis of learners is all about describing learners' characteristics including age, gender, skills, and economic status. Statement of objectives subsumes the description of the expected learning outcomes; and these can mostly be seen in learners.[23-25]. This is mainly because even the selection of technology takes into account learners' characteristics and foreseen achievements. The selected media and materials have to initially be tested to see that they work accordingly. The requirement of learners' participation is meant to ensure active involvement of learners in the educational processes. This entails giving tasks to learners for them to practice new skills as a means of obtaining feedback on their achievement prior to formal appraisal. Therefore, evaluation of technology tool is essentially the assessment of the efficacy of the technology tool in facilitating learners' achievement of the anticipated objectives. In this article, the ADDIE model has been adopted mainly due to the specification of the steps for technology integration and its advocacy for active learners' participation.

2.3 Participatory Technology Development (PTD)

Another guiding framework for technology integration in instructional processes is the Participatory Technology Development (PTD). This is among the prominent approaches in system development which also champions participation of stakeholders. The PTD is a creative process of collective experimentation and research aimed at improving livelihoods.[26] Conroy and Vadher[27] are of the view that PTD is helpful in integrating users' knowledge and experience in pursuit of solutions, and appraising the functioning of promising technologies in real-life situations. The usefulness of PTD is also attested in the provision of quick feedback on the results of technology testing before subsequent identification and dissemination to users at reduced costs and length of research cycle.[27] Besides improvements in the technology acceptance and reducing temporal and financial costs, the results of joint efforts ensuing from stakeholders' participation essentially brings together government and other stakeholders to solicit capacity building and other resources to effect integration of technology.

3. METHODOLOGY :

An investigation was mounted to define the perceived educational technology design preferences based on the views of pertinent stakeholders comprising primary school pupils, parents, head teachers and mathematics teachers. The preference of primary school pupils was motivated by the need to inculcate the habit of positive technology use from early ages. In addition to that, the researcher thought that the use of educational technology would help tackling the challenge of inadequate academic performance in mathematics.[28,29] The investigation was done in three largest cities in Tanzania, namely Arusha, Dar es Salaam and Mwanza, whose population was also believed to have the necessary technological infrastructure.[30-32] One district in each of these cities was involved, and that included Meru District Council (Arusha), Kinondoni Rural (Dar es Salaam) and Misungwi District Council (Mwanza). It was assumed that these three peri-urban districts had modest socio-cultural and economic conditions and thus could also reflect the diverse socio-cultural characteristics typical of many regions in the country.

A preliminary study was carried out to choose a school that was actually using educational technology for instructional purposes, and consequently, one was found in Arusha. It was thought that the use of educational technology for instructional purposes would persuade OST learners to increasingly use instructional technology during OST learning. Likewise, it was expected that parents would also be influenced by the envisaged educational technology and thus encourage and assist their children in making use of educational technology more systematically.

The initial study involved some 27 class 4, 5 and 6 pupils; 22 parents (22); and four (4) mathematics teachers. The picked pupils were earmarked on the basis of the results of the preceding semester examination. It was rationally thought that the best performing pupils were more likely to study during out of school time, and thus were equally more likely to have used educational technology than those who had relatively poor performance. The best pupils and their parents were preferred because the aim was to learn the preferences of the best perceived content of educational technology from successful stakeholders. The involved stakeholders were to state their preferences of educational technology content design, and this had two levels. Level one was related to the percentage of a given preference within a specified category of respondents, whereby the practices mentioned by 50% or more were considered. On the other hand, Level two was about picking the preferences that featured in all categories of respondents by at least 20%. The ensuing list was confirmed by experts and literature sources. Afterwards, the responses were used to design the questionnaires which were given to the respondents in the three research regions; and the respondents had to rank their consensus with the enumerated preferences of the technology design. The questionnaire adopted the form of the Likert scale whereby the respondents could rank their perceptions in relation to each preference.

The researcher won the assistance of District Chief School Quality Assurance Office and benefitted a lot from their knowledge and practical experience with the respective schools. The ultimate aim was to pick at most 4 best schools in the three regions. The pupils in such best schools were thought to have been engaged in OST learning more than pupils in the low performing primary schools, and of course most of them indicated to have some idea on digital world. Specifically, the best pupils in best day primary schools were ideal since would translate their conventional learning study experiences into the world of technology and thus use their real experience with the digital world to share their perceptions of the preferences of educational technology design and the best practices.

Similarly, mathematics teachers in the best schools could have been more involved in the practical teaching such that they could have more insights on learning and using educational technology. Equally important was the involvement of parents of the selected best pupils and their insights regarding parent-related activities. Moreover, pupils in the three upper classes were expected to have more experiences with OST learning and so were more proficient in following instructions than pupils in lower classes of primary schools. The selected pupils, parents and mathematics teachers in the selected three regions were to rank their preferred strategies for the design of educational technology content. The obtained information was summarized in a data sheet, coded and presented in tabular graphical forms using descriptive and statistical techniques.

4. FINDINGS:

4.1 Use of explanations

According to the findings, some 33% of pupils, 46% of parents and 44% of teachers in each region indicated that the explanatory presentation is very advantageous, while some 38% of pupils, 34% of parents, and 27% of teachers from each region were desirous with the method. Therefore, it was generally concluded that majority of pupils, parents and mathematics teachers perceived the use of explanation as best preference of educational technology content.

4.2 Use of examples

Regarding the use of examples, some 65% of the pupils, 56% of parents, and 41% of teachers showed that the techniques was very useful. It was indicated further that use of examples could enable pupils to comprehend difficult concepts and operations in mathematics. The findings suggested that most pupils, parents and teachers favoured the use of example as the best preference of educational technology content design.

4.3 Use of practical work

Involvement pupils in practical works seemed to have been more preferred by all pupils, parents and mathematics teachers in all the three regions involved in the investigation. Specifically, use of practical activities was credited by 81.5% of pupils in Arusha, 83.3% in Mwanza, and 65.5% in Dar es Salaam. Similarly, practical activities were supported by 74.1% of parents in Arusha (74.1%), 55.5% in Mwanza and 62.5% in Dar es Salaam. The technique won the support of 61.1% of teachers in Arusha, 80.6% in Mwanza and 81.6% in Dar es Salaam. This implies then that the consulted stakeholders found hands-on experiences useful to the development of practical skills as it could trim down abstractions in learning mathematics.

4.4 Assignments after instruction

The same trend observed in the previously mentioned techniques featured in the use of assignments after instructions. This was attested in the responses of 44.4% of learners in Arusha, 75% in Mwanza and 69% in Dar es Salaam. Moreover, 72.2% of teachers in Arusha, 47.2% in Mwanza and 76.3% in Dar es Salaam indicated that giving assignments after instructions quite helpful. Moreover, 63% of parents in all the three regions supported the technique. Generally, majority of respondents rated the use of post-assignment approach the best preference of instructional technology design.

4.5 Illustration through drawings

The use of drawing in designing instructional technology also attracted the interest of the involved stakeholders across the regions. For example, 50% of teachers in Arusha, 44.4% in Mwanza and 52.6% in Dar es Salaam showed interest in the method. These statistics imply that majority of learners and teachers favoured the use of drawings, though the proportion of the parents who preferred the technique was below 50%.

4.6 Use of teaching aids

The findings also suggested that the use of teaching aids in the presentation of educational technology contents is very useful as indicated stakeholders involved in the study. The method was preferred by about 63% of respondents in the three categories across the study regions.

4.7 Story-telling

Story-telling a presentation technique was credited by 30% of the respondents in all the three in the three study regions. The same was also considered necessary by 37% of learners, 35% of parents, and 50% of teachers in all the three study regions. For that reason, it could be concluded that, in comparison with explanation and use of examples, use of story-telling was somewhat less credited, and thus, it was not give due regard in the design of the content of the educational technology. The reason for giving story telling technique little consideration could be its inherent time-consuming character; stakeholders would wish to use a technique which could save time instead of paying attention to stories. Conceivably this technique could be more appropriate to lower primary school pupils since they need to conceive the basic concepts in mathematics such as addition and subtraction which may require a lot of stories.

4.8 Illustration through cartoons

The use of illustrative cartoons attracted some 23% of pupils, 34% of parents and 39% of mathematics teachers. These statistics suggest that teachers were comparatively more attracted by use of cartoons during presentation than were pupils and parents alike. For example, 38.9% of teachers in Arusha, 22.2%) in Mwanza and 31.6% in Dar es Salaam showed interest in the technique as compared to pupils whereby 3.7% of them in Arusha, 22.2% of them in Mwanza and 6.9% of them in Dar es Salaam preferred the method.

4.9 Use of songs

According to the findings, the use of songs could be said to be the least desired technique across the three categories of respondents. This is attested in the observation that 14.8% of pupils in Arusha, 22.2% in Mwanza, and 37.9% in Dar es Salaam showed interest in it. Likewise, some 31% of parents and 28% of teachers in the three regions were attracted by very the technique. As compared to the previously identified techniques, the use of songs was to some extent less favoured by the involved stakeholders across the study regions. However, songs could be more suitable to pupils in lower primary school grades than the upper grades involved in this investigation.

5. DISCUSSION:

Technology design preferences observed in this investigation have been identified as among the most effective modes of presentation of contents of educational technology.[33-36] Such techniques included the use of examples, story-telling, cartoons, songs, drawings, explanations, practical works, questioning, and teaching aids. The use of such techniques in presenting and delivering the technological contents is also observed in the current literature. The use of drawing in the presentation of educational content is practical in the creation of visual cues which give emphasis to spatial relationships in the solving problems in mathematics, which also contributes to successful problem solving.[37] The use of questions is an essential technique since pupil could weigh himself or herself in the extent she/he captures and the lesson after classroom instructions.[38] A sizeable body of research shows that for beginner pupils, use of worked examples is better than on problem solving techniques.[40] Novice learners benefit more from instruction that is based more on worked examples as it helps pupils to spend less time in problem solving.[39]

Haara[40] established that practical-oriented tasks make pupils engage in concrete activities; and at the same time do the activities to enhance and consolidate the understanding of concepts which are characteristically abstract. Meesen[41] also shows that explanation technique makes learners comprehend the fundamental steps in the performance of mathematical problems. Similarly, Ahmed et al.[42] explain the significance of teaching resources as didactic materials for enhancing learners' ability in mathematics, arguing that it cements all the crucial elements related to mathematics and enables learners to unveil their various experiences a manner that helps them reflect old issues and bring to surface new ones. This is also recognized by Caven[43] who adds that teaching aids are quite productive especially when favourable learning context is ensured.

6. CONCLUSIONS AND RECOMMENDATIONS:

In general, it has been found that majority of stakeholders involved in this study prefer educational technology designs which mainly engage pupils in diverse activities, especially those accompanied by application of instructional aids, use of illustrative drawings and post-instructional questions. Furthermore, most stakeholders preferred the use of explanation and illustrative examples which bring about more understanding of the subject content. Thus, the proposed designs of the contents of educational technology were given due weight in developing the contents of the envisaged educational technology. It is then recommended that local educational technology experts need to venture into designing instructional technologies which are affordable and compatible with pupils' environment, and the stakeholders preferences in general. Furthermore, the intended educational technology should be in line with the standards of the prevailing educational regulatory agents such as NECTA, since are the same standards used in such schools. Likewise, research bodies and higher learning institutions should contribute to the development of most effective educational technologies through research and consultancies on the most workable software and hardware for OST technology integration.

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