MUSIC SOFTWARE DEVELOPMENT FOR GHANAIAN MUSIC EDUCATORS IN TERTIARY INSTITUTIONS.

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Abstract

During the 20th Century, the field of education witnessed dramatic changes in pedagogical strategies engendered by information and communication technology (ICT). Computer-assisted instruction has, in some instances, replaced the student-instructor interaction in the teaching and learning environment. Arts educators, who, for a long time, adopted the *apprenticeship* approach to teaching, where the master artistes teach the novices, have also embraced the computer-assisted interactive approach. Since the year 2000, Departments of Music in Ghanaian Universities have been exposed to innovative teaching in which ICT is employed. However, in the area of music instructional technology, little has been done by Ghanaian music educators, especially in the area of music software development. The purpose of this paper therefore is to encourage music educators in tertiary institutions to acquire skills in the development of music software and utilize them for the enhancement of teaching and learning.

Introduction

Music software development concerns the development of music application software, which may either be notation software for the composition of music or tutorial software for the teaching of music history, theory and applied music. Music tutorial application software, often referred to as music instructional technology, enhances the teaching and learning of music. As we move into the 21st century, the need for innovative ways for the teaching of the performing arts has become compelling.

According to O. M. Hartsell (1971) music instructional technology today consists of far more than visual aids. It represents a dynamic educational force encompassing the entire system for learning, the process of instruction, and the total environment for music education. No music teacher can afford to ignore the currency of such resources for learning. Current generation of students require from teachers more relevant, challenging, and commanding modes of education responsive to the times and the needs of each individual. A research conducted by the author of this paper revealed that music tutorial application software developed by Ghanaian music educators for the teaching of African music was nonexistent. The writer of this paper, therefore, developed a tutorial application software, *adowa*, to demonstrate that the acquisition of skills in the development of music software is within the capacity of Ghanaian music teachers.

Extant Music Application Software

According to Brian and Webster (1995) Music software development began in the 1940s when Frank Codson developed ear training drills using examples on magnetic recording tape. In the 1950s, Presser invented the first automated teaching machine based on Skinnerean concepts of behavioral modification. Norman Crowder (1960) on the other hand proposed the development of programmed instruction to customize instruction to different ability levels.

In the 1960s, James Carlsen developed the first music programmed instruction for melodic dictation with prerecorded patterns on magnetic tape. In the 1970s, David Shrader developed a rhythm teaching machine and David Williams developed the first Music Instructional Technology software. Nonetheless, it was in the 1980s that CD-

ROM, CD audio format and Musical Instrument Digital Interface (MIDI) were established worldwide.

Furthermore, Delaware established videodisc music series for interactive instruction. Nonetheless, from the 1990s up to the present time, there has been the influx of applications software for the teaching and learning of music. Examples are, ‘ear-pro’, ‘finale’, ‘capella’, ‘kamien’, ‘chord wizard’ ‘ music star’, ‘musical tutorial’ etc. Research has demonstrated that traditional methods of teaching music, dovetailed with music instructional technology, achieve remarkable results. For example, Lindeman (1979) created three lessons in rhythm for pre-service elementary teachers using a computer to present text, printed music notation, and an audio tape. The subjects in her study found the lessons to be “an interesting way to learn” and “valuable for working at one’s own pace.”(ibid).

Elckmann and Fowler (1999) on the other hand state:

> Computer-assisted instruction encompasses both human and nonhuman resources; it includes not only electronic communication media, but a systematic design, implementation, and evaluation of the entire process of learning and teaching. (p. 34)

However, it must be noted that computer-assisted instructional design is complementary to the work of the teacher; it does not replace him. Furthermore, Elckmann and Fowler (1999) assessing the impact of new technologies on the teaching of music noted:

> Current Technologies open vast new possibilities both to the music teacher and to his students. Music teachers can increase the whole range and impact of their teaching if they exploit present-day technology to assist them in their efforts. Technological tools are used in numerous ways. A particular medium may be used adjunctively to assist in the presentation of material. An overhead projector shows positions of various chords to a guitar class, or a map of the countries and cities of Medieval Europe to a class in music

> history. In this case, the teacher uses the media to supplement his own style of presentation while remaining in complete control of content." (p. 39).

In any case various educational media spare the music teacher many redundancies. For example, teaching and administrative strategies may be shared by means of prepared programme on closed-circuit television. Elckmann and Fowler (1999) aver that rudiment of music is taught through a programmed text. In this case, the teacher steps aside, permitting the technology to replace some of the repetitive aspects of teaching.

In the preceding discussion it can be observed that the development of music instructional technology in Western countries is ongoing and progressive. However in Ghana, the use of instructional technology for the teaching of music began with the advent of radio cassette and gramophone players in the sixties. This was followed by computers and overhead projectors in the eighties. In the nineties, music departments in universities introduced the use of application software for the teaching and learning of music. However, it was observed that the number of applications available were limited. The writer, however, has developed two tutorial applications software for theory and the learning of *adowa* drum patterns.

Significance

Music instructional technology is new to our present educational system; as a result, little has been done so far to introduce it in our music educational programmes at all levels. This is because most Ghanaian music lecturers lack knowledge and skills in the development and use of music instructional technology. It is therefore hoped that this paper will enhance the knowledge of music lecturers as regards the significance of music instructional technology for the learning and teaching of music. According to Albright and Graf (1992)

> Instructional technology permits the addition of visuals, sound, and motion to information display and can be an effective means of enhancing teaching and learning.

Nonetheless, the significance of instructional technology in the teaching and learning of music depends on how effectively they are used. Thus when used appropriately and effectively, they can help enhance the teaching and learning of music in the following manner: Instructional technology can bring to the classroom situation, places, people, images, and events which cannot be produced with an orthodox method of teaching music. For example, during music appreciation lessons, it can help students to overcome deficiencies through drill and practice. Furthermore, students can be helped through drill and practice to master the names of the lines and spaces for the bass and the treble staves, chords, identify intervals and their tones, and rhythmic patterns. Furthermore, it removes the boredom which would have been inevitable if the student had learnt music without instructional technology. Instructional technology can help to increase student and instructor productivity by reducing the time spent on routine record-keeping and communication between instructors and students.

The development of the adowa application software.

Macromedia Authorware is the main application software that supported the building of the *adowa* application software. Lubensky (2003) has noted that authorware integrates graphics, sound, animation, text, and video into compelling rich-media learning solutions. According to Lubensky, authorware interface provides a fast and easy environment for creating interactive applications. Drag-and-drop icons support rapid application prototyping and development without the need for extensive scripting. The flow-line provides an intuitive representation of the structure of large, highly branched learning applications. Thus macromedia Authorware 7.0 and above extends the power of the visual interface in Authorware by adding the ability to easily synchronize media and events over time.

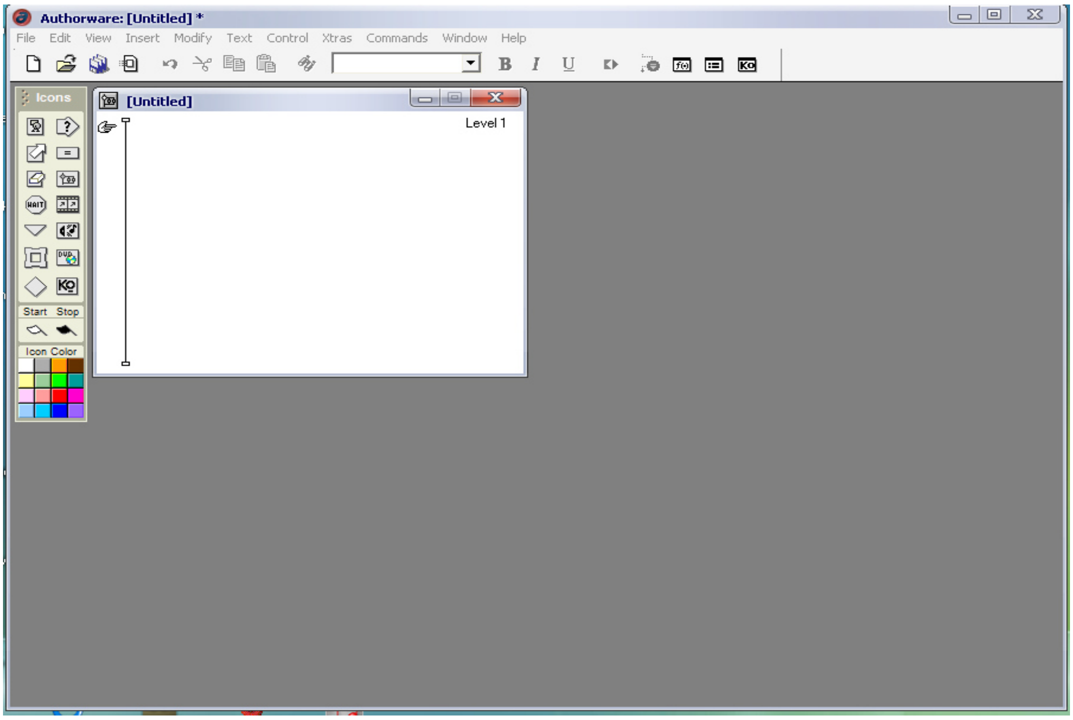

Authorware: [Untitled] *
File Edit View Insert Modify Text Control Xtras Commands Window Help
Icons
[Untitled]
Level 1
Start Stop
Icon Color

Figure 1: The interface of authorware application software.

Furthermore, Lubensky (2003) noted that the new Media Synchronization feature allows an author to display media or trigger any event based on media position in a sound or movie file. According to him, authorware has always offered a powerful environment for creating applications driven by user interactions. Now, authors can easily coordinate media and events over time using a simple, drag-and-drop interface. Already capable of delivering applications on multiple platforms, Authorware 7.0 streamlines the publishing process with new One-Button Publishing. One-Button Publishing integrates and automates all the steps in the process, making it easy and efficient.

The following tools of Authorware were used for the development of *adowa* application software. The display icon, the decision icon, the interaction icon, the framework icon, the map icon, the sound icon, the movie icon, the icon colour palette, the calculation icon' the navigation icon and knowledge objects.

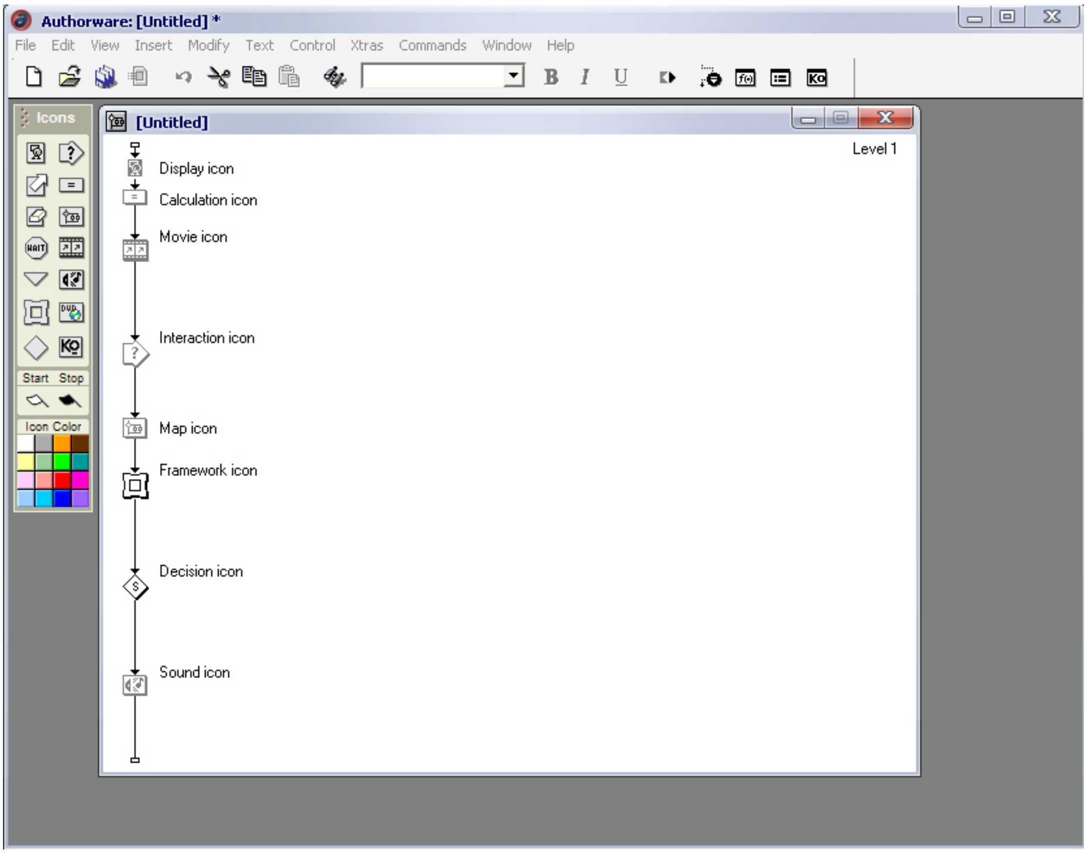


Figure 2: The icons of authorware as shown on a flow-line.

The display icon was used for text, graphics, sound and video. Navigation icon assisted in moving from one frame to the other or to navigate to the main menu. Framework icon was used to store many icons. Furthermore they were used to create chapters and pages for the application software.

Decision icon helped with decisions pertaining to branching from one frame to another. Interaction icon was used either to create menus or for text, graphic, sound or video. Calculation icon was used for codes. Map icons grouped together several icons. Sound icon was used for the importation of sound in different formats, such as MP3, WAVE, SOCKWAVE, etc. Digital icon was used to play digital movies. Icon colour palette was used to colour various icons to visually organize content in the application.

The design of the *adowa* application software begins with a knowledge object called ‘Set Window Caption’. This was used to set the caption *Adowa* for the application software. The next icon on the flow line was a calculation icon. In this icon was the following code (AdowaVersion:=Icon Title short (Icon ID). This code made sure that the title for the application was maintained in all the pages of the application software.

The next icon was a calculation icon which had the following codes:

```
(acNavigation Layer:= 99)
(acNavActive:=True)
(Resize Window (800,600)
```

The first code helps the user to navigate to every page within the software which should not be more than 99 pages for each chapter or map icon. The second code was an auxiliary one which helped to make the first code active. The third code sets the size of the window for the application software. Thus the first figure (800) represented the width whilst the second figure (600) represented the height. The third icon on the main flow line was also a calculation icon. This icon contained the following codes:

```
Adowa File:= RecordsLocation ‘Adowa. Log’
acTopicDoneList:=List
(Read Ext File (Adowalogfile)
Temp number 01:=Icon Num.
Children (@ ‘Adowa application framework”) – 2 If List Count (ac topic Arne List & Temp number 01 then ac Topic Done List: = Array (“0”, Temp number 01)
end if.
```

The codes above were used to display the topic completion indicators. The acTopic DoneList helped the user to navigate through each major topic and sub topics.

The next on the main flow line was a display icon which was used to set the background for the application software. The next icon on the main flow line was a map icon which contained an interaction icon, two map icons and a calculation icon. The first map icon contained a decision icon and a navigation icon which helped to reset or lead back to the main menu of the application software.

The second map icon contained a calculation icon followed by a decision icon with a navigation icon linked to the decision icon. This helped the user to quit the programme. Thus the calculation icon had the following code. If acITSActive= 1 then call ScriptIcon (a.SayText+fn, “Are you certain you wish to quit? (OK, cancel).

End if.

The next icon on the flow line was an interaction icon with nine navigation icons which helped the user to navigate through the nine menu items as follows:

Overview; Bell, *Donno*, *Atumpum*, *Apentema*, *Petia*, Quiz practical and quiz written and Manual.

All the major icons on the flow line were put in a framework icon which was named as *adowa* application framework. This framework had nine map icons which contained the pages for the nine menu items or topics. The last icon was a calculation icon which was used to quit the application software.

The Operation of *Adowa* Application Software

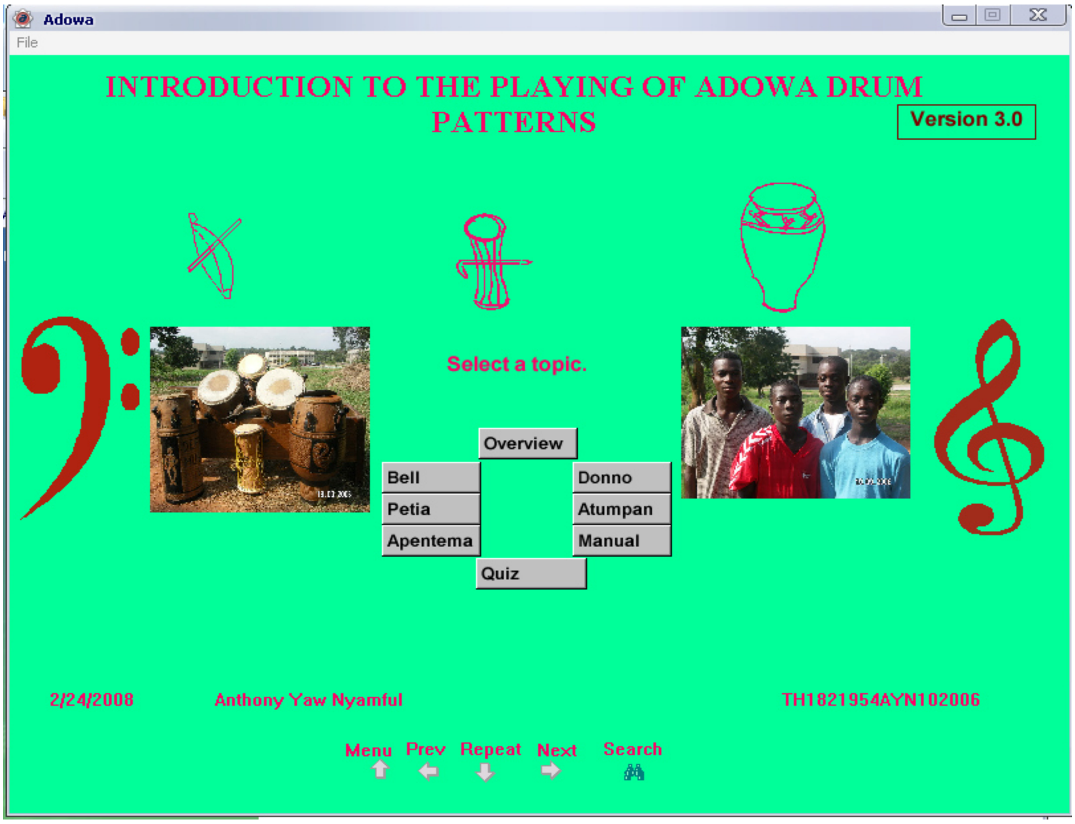


Figure 3: The interface or the main menu of the *adowa* application.

The main menu of the *adowa* application as shown above, was easy to use. The software was therefore user-friendly because the user clicked on buttons to get access to various topics. The interface was made up of the following: Main Topic: Introduction to the playing of *Adowa* drum patterns. Version 3.0: File menu: The file menu had the following sub-menu 1. Reset Menu (with Alt + M as the shortcut.) The reset sub-menu was used to reset the programme. 2. Quit menu: This was used to quit the programme (with Ctrl + Q as the shortcut.)

The following buttons were used to access the various topics: The Overview button. The overview button introduced the user to *adowa* in general. The user was therefore taken through five pages or screens. With regard to the first page, the user was given a general view of *adowa* in a video format. The second page consisted of an example of a complete video of *adowa* performance. To play the video, the user had to click on the play button. Arrow buttons were three in number. The right arrow button opened the various pages or screens from page one to the highest page. The left arrow button opened the pages backwards to previous pages. The down arrow repeated the same page from the top. Search button. This helped users to another main menu where the user could access directly all major and minor topics. To do that the user had to use the down button or the up button to select a topic. On the other hand, the user clicked on a topic to select it. The selected topic was then seen at the top in yellow colour. The cancel button helped the user to get to the main menu. *Apentema* button helped the user through the pages consisting of a brief write-up on the *apentema* drum. Quiz button: This button helped the students to test their knowledge on the write-up by going through a quiz which was practical and written.

Pinnacle Studio Plus

Pinnacle studio plus version 9 is an advanced video editing and disc authoring application whose intuitive interface and seamless workflow provide video enthusiasts with on-demand access to hundreds of professional-quality functionalities like chroma key and picture-in-picture effects, image stabilization, automated editing, colour correction, noise removal and digital surround sound, while maintaining total ease of use from start to finish.

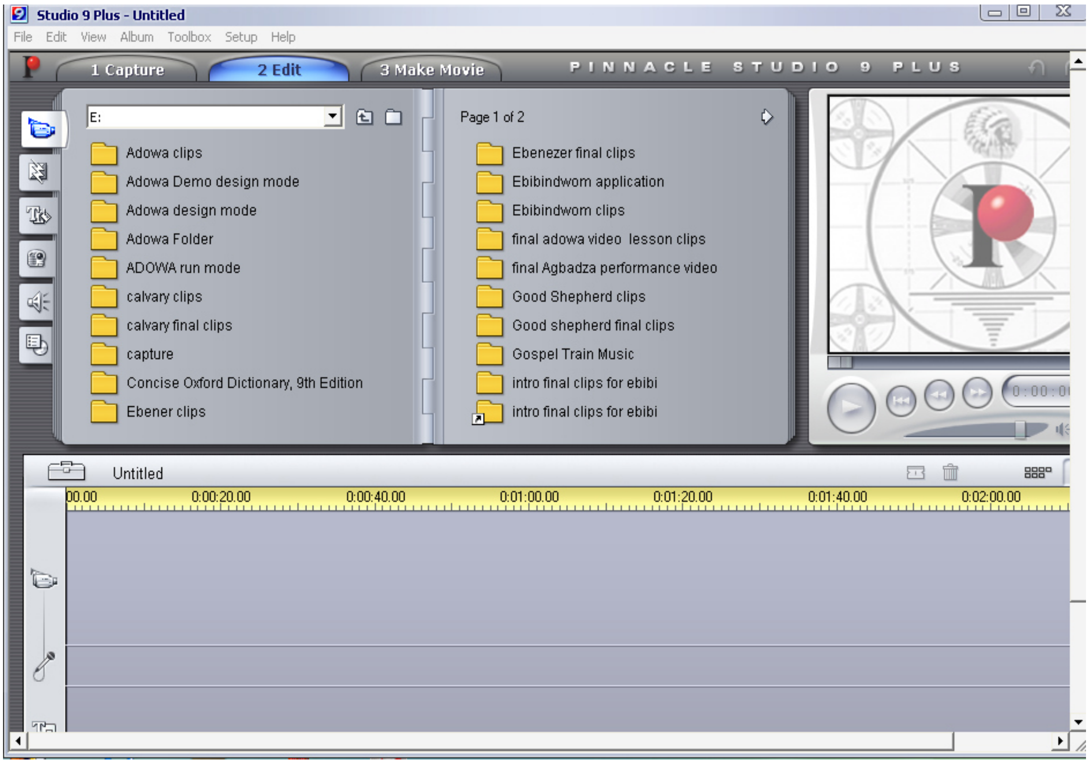


Figure 4: The interface of pinnacle studio plus.

Pinnacle Studio Plus has automated features to make video editing faster and easier. Smart capture minimizes the space of videos on a hard disk while smart sound generates background music that fits the length of edited movies. Multiple video and audio layer support to create professional special effects such as Picture-in-Picture (PIP) which lets one place one video scene inside of another, or chroma key (blue screen) effects that let one put oneself into any video scene. At any time during the editing process, you can instantly watch your production in full screen. At the heart of Pinnacle Studio Plus is a professional quality video editing system, which delivers all the power needed to quickly go from capture to a finished movie.

All the video clips for the *adowa* application software were made with Pinnacle Studio Plus through basic steps of capturing, editing and making movies. Thus the first step of editing was to capture the video which was done with the aid of a card reader. After this, all the scenes were automatically detected from the beginning to the end. Picture icons were thus created for the scenes detected.

The edit tab was then clicked on to switch to the edit mode. The picture icons were respectively dragged and dropped unto the timeline view. In order to be sure of each scene, it was reviewed by clicking on its icon and played by clicking on the play button in the player window. The quality of each clip was improved by first selecting the clip. The author then clicked on the video toolbox button and selected the plug-ins tab. Plug-ins such as automatic colour correction was used to restore video that was too dark and had poor colour quality. Similarly, the stabilized plug-in was used to smooth out any shaky videos. The noise reduction plug-in was used to remove any background noises.

Transitions were then added to the video by first clicking on the transition tab. Variety of transitions were displayed and were thus selected and added to the scenes. This made the introductory clip of the *adowa* application software very beautiful and thus gave it a professional touch. Titles were added clicking on the title tab which led to the title window where editing of the title was done. Finally the title was added to the video. This was how the title, "Welcome to the study of *Adowa* drum patterns for basic schools in Ghana" was done with transitions.

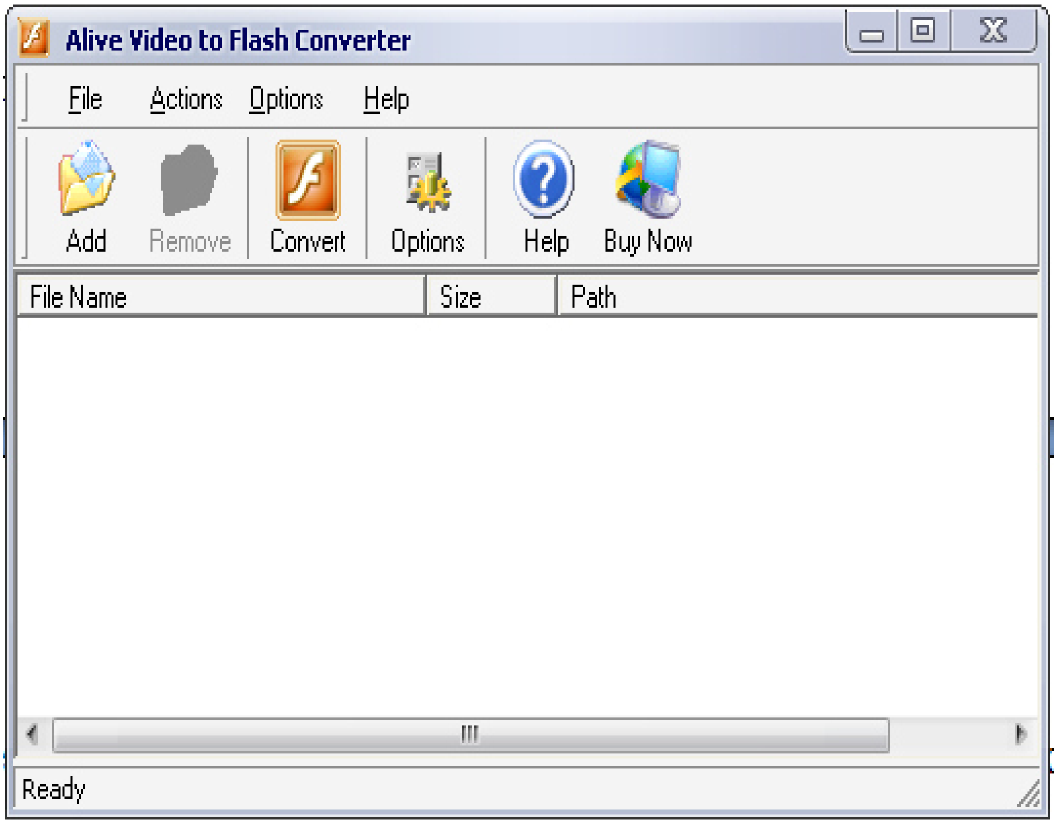
Finally, the movie was made by first clicking on the make movie tab located at the top of the screen. The type of movie made depended on the tab that was clicked. Thus in the case of movies for the *adowa* application software, the MPEG tab was clicked. Finally, to create the video, the create button was clicked. The final video was saved and compressed into flash file with "alive video to flash converter". This made the file very small and portable. It was then exported into authorware to form part of the software.

Alive Video to Flash Converter

Alive Video to flash converter is one of the major applications software that supported the development of the *adowa* application software. It is an easy-to-use video converter which is used in converting popular video to Flash FLV and SWF streaming Macromedia Flash video format. It supports all popular video formats, such as AVI, DivX, XviD, MPEG, MOV, MPG, MOD, QuickTime, MP4, M4V, 3GP, 3G2, GIF, DV, MJPEG, VOB, WMV, ASF. One can therefore convert videos to Flash SWF and FLV for sharing on the web easily and quickly. Flash videos are very useful for the development of multimedia application software involving the use of many video clips. This is because it is able to compress a very big video file format to a very small size and still maintain the quality of the video. For example a file size of about 900 MB could be compressed to 20 MB. Furthermore, the files can be exported to PowerPoint for teaching purposes.

Alive Video to Flash is integrated with Windows Explorer, and allows one to right-click on video files to convert video to flash without launching Alive Video to Flash Converter in advance. In addition, the interface makes Alive Video to Flash Converter the perfect tool for both new and experienced users. It gives advanced users the ability to finish the conversion with schedule in batches, drag-drop to load or add video files for converting.

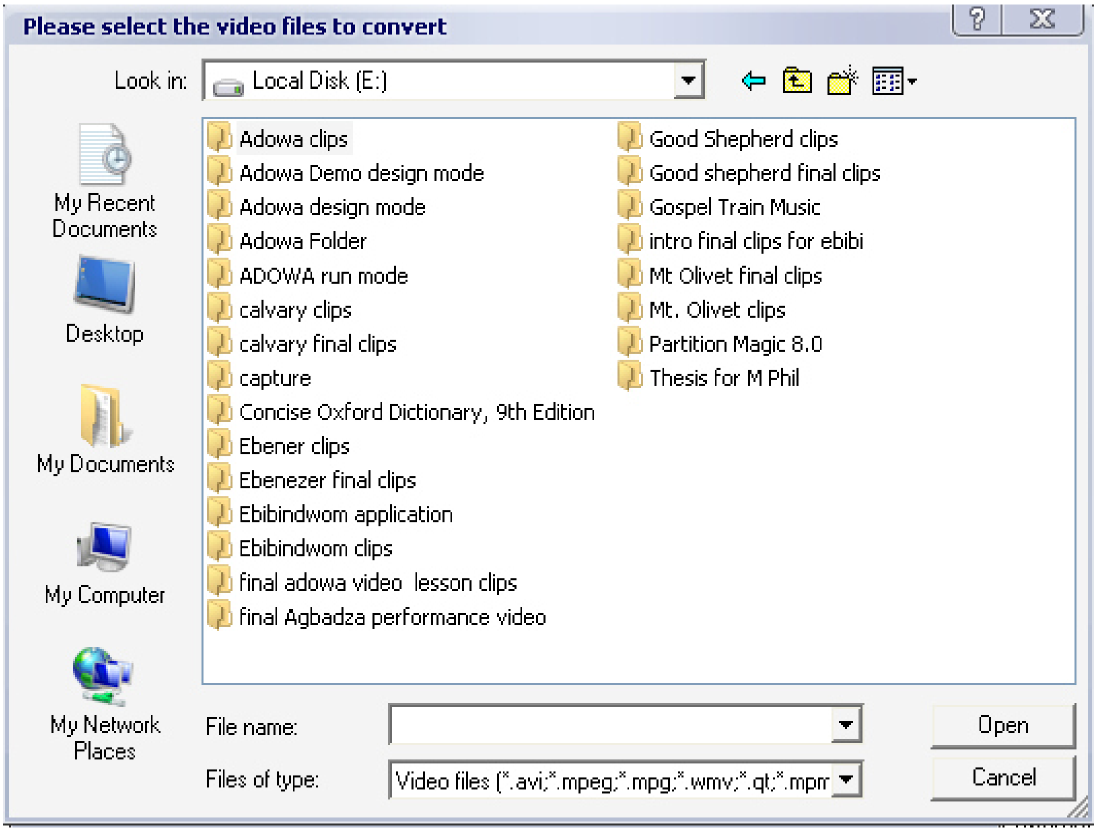
For the development of the *adowa* application software, alive video to flash was used in the following manner. After the final video files have been made with studio nine plus, they were exported to alive video by clicking on the ‘Add’ button of the following interface.



Ready

Figure 9: The interface of Alive video to flash converter.

A dialogue box appears which leads one to locate the *adowa* video files, as shown in the following dialogue box.



Please select the video files to convert

Look in: Local Disk (E:)

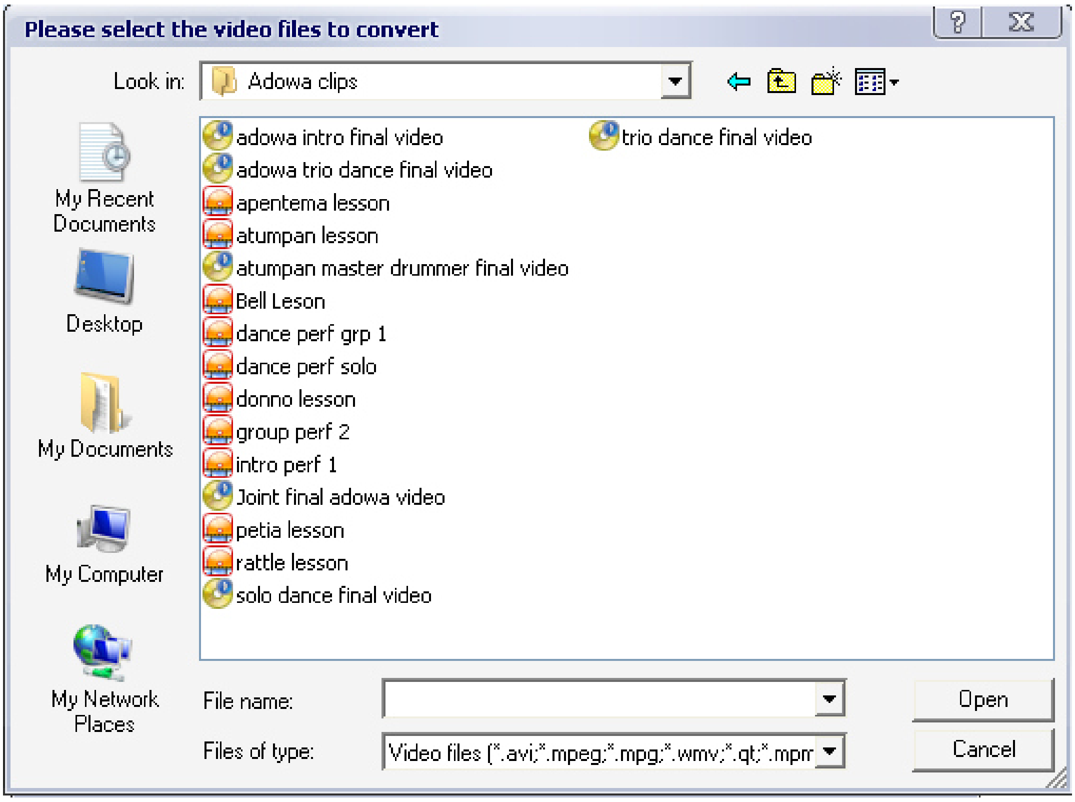
- Adowa clips
- Adowa Demo design mode
- Adowa design mode
- Adowa Folder
- ADOWA run mode
- calvary clips
- calvary final clips
- capture
- Concise Oxford Dictionary, 9th Edition
- Ebener clips
- Ebenezer final clips
- Ebibindwom application
- Ebibindwom clips
- final adowa video lesson clips
- final Agbadza performance video
- Good Shepherd clips
- Good shepherd final clips
- Gospel Train Music
- intro final clips for ebibi
- Mt Olivet final clips
- Mt. Olivet clips
- Partition Magic 8.0
- Thesis for M Phil

File name:

Files of type: Video files (*.avi;*.mpeg;*.mpg;*.wmv;*.qt;*.mpm

Figure 10: A dialogue box 1 for Alive video to flash converter.

The ‘*adowa* clips’ folder was double-clicked on to get access to the *adowa* video files as follows.



Please select the video files to convert

Look in: Adowa clips

adowa intro final video
adowa trio dance final video
apentema lesson
atumpan lesson
atumpan master drummer final video
Bell Leson
dance perf grp 1
dance perf solo
donno lesson
group perf 2
intro perf 1
Joint final adowa video
petia lesson
rattle lesson
solo dance final video
trio dance final video

File name:

Files of type: Video files (*.avi;*.mpeg;*.mpg;*.wmv;*.qt;*.mpr

Figure 11: A dialogue box 2 for Alive video to flash converter.

The files were then selected and converted to flash video files by clicking on the convert button. The option button was used to select the required size of the video; which was 720 by 480. The converted video files were saved and exported into macromedia author ware for the development of the *adowa* application software.

Methods that guided the Testing of the adowa application software

It has been established that the *adowa* application software was built with the aid of the following applications software; Authorware, Pinnacle Studio Plus, Alive video to flash converter, Alive video converter and Sound Forge. However, to test the feasibility of the *adowa* application programme and its efficacy in helping children to learn *adowa* patterns, a total of thirty children were randomly selected from three schools in Accra, ten from each school. A comparison of the frequency of the test scores before and after indicated an improvement of the scores after using the software.

Each group of ten children was made up of five boys and five girls. However, during the teaching process, the children were mixed up with three boys and two girls in the first group. The second group, on the other hand, consisted of three girls and two boys. The purpose was to give each gender an opportunity to learn all the five *adowa* instruments. The children were also required to complete a set of questionnaire and respond to quiz items to test their knowledge of *adowa* music. After they had learned to play *adowa* drum patterns they were again requested to respond to a quiz. The aim of the questionnaire and the pre-and-post test on *adowa* drum patterns was to undertake a comparative study of children's ability to play drum patterns before and after the study of the *adowa* drum patterns.

The teaching and learning process began with the first group of ten children from the first school. *Adowa* instruments had randomly been shared among the group. Each student was taught how to play their respective instrument, through the use of *adowa* interactive software. The children had the opportunity to learn how to play the *adowa* patterns. Finally, all children played the various instruments in an ensemble as demonstrated in the software. The same procedure was used for the second group from the same school. The same procedure was followed to teach students of the two other schools. The results of their performance before and after learning to use the application software were compared to ascertain the efficacy of the software. The research instrument included performance tests and questionnaire. The questionnaire was designed in such a manner that arbitrary answers given by any of the children could be easily detected. For instance, if the student answered question 2 by stating that he or she listens to classical music five times or more within a week, then he should be able to name at least one classical composer and the title of one piece of classical music.

The most important achievement was that, in all the three schools in which the software was tested, it was possible to teach the students how to play *adowa* drum patterns. The children became interested in the use of the software to such an extent that all the students who took part asked for a repeat of the programme. Some of the children, who did not obtain high marks, before the use of the software, obtained higher marks after using the software. An interesting feature of the study was that the children were able to play the drum patterns together with ease.

Conclusion

It has been established that there is the need for innovative ways of teaching the performing arts. It is therefore imperative for music educators in Ghanaian tertiary institutions to develop their skills in instructional technology for the enhancement of teaching and learning of music. This is because instructional technology goes beyond visual aids. It represents a dynamic educational force making the learning process an easy and fascinating activity which motivates music students to increase their theoretical, aural and practical skills. Furthermore, students of the present generation demand something more than the orthodox approach to the teaching and learning of music. For example, they demand that music lecturers learn to set electronic questions, write electronic books and develop tutorial applications involving video and audio formats. Thus in ethnomusicology, music appreciation, and history of music, lecturers could create in lecture room, real life situations for the enhancement of the learning and teaching of music. The development of the *adowa* application software has demonstrated that creating an interactive computer application for the teaching and learning of music is within the capacity of music educators in tertiary institutions in Ghana.

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