

INTERACTIVE MULTIMODAL TOOLS AND LEARNER ENGAGEMENT TO SUPPORT ACTIVE E-LEARNING

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ABSTRACT

Current computer technology and various multimedia tools play an increasingly important and effective role in enhancing the learning process. However, current educational multimedia systems still suffer from a major drawback that they don't support active interaction and engagement of learners. Nowadays, multimodal information interfaces which depend on learner active-engagement have gained considerable research and development interests. This trend is expected to continue as designers keep addressing challenges in information presentation such as interface and performance improvement. This paper mainly presents Active Multimodal Information Presentation in life cycle phases and shows how learner engagement fits into this model to support active multimodal e-learning. The paper ends with summarizing resulting steps to be taken to adapt this new effective trend in e-learning applications in order to achieve successful learning outcomes.

Keywords: *Active presentation, Interactive learning, Multimodal information presentation, Learner engagement, E-Learning.*

Stream: *Technology in learning*

1. INTRODUCTION

Visual, digital and traditional culture with the help of available computer technology and multimedia tools merge towards enhancing learning environment by having appropriate types of material coined and assigned to proper modalities. These in fact require the achievement of coherent integration between modalities[6]. While most of the current studies

investigate the appropriation of traditional media such as films, integrated components of Human Computer Interaction (HCI) try to clarify and understand the reception of, and interaction with, new media, new modes for learning presentation, interactive systems and information technology.

Nowadays, one of the most promising aspects of e-learning consists in the opportunity to activate learners depending on engagement with learning content and shift the responsibility for the learning outcome more to the learner [1][7][12]. The development in technology and increasing educational demands on active education motivate learner engagement and stimulate multimodal presentations [5].

Active Multimodal Presentations (AMPs) are short stand alone and free running multimodal presentations that form up a computer based multimodal learning environment using appropriate integration of speech, imagery and gesture [3][6]. However, the awareness of the challenges of multimodal information presentation and effective interaction is extremely low. This paper aims at providing an overview of AMP, putting AMP learning mode in life cycle model and addressing the role of active engagement of learners to enhance active multimodal e-learning.

2. BACKGROUND

Many computer related fields play an increasingly important role in improving education and learning process, such as multimedia technology. However, current research shows that educational systems which involve multimedia technology whether it is being used in input or in output suffer from a major drawback that they don't support active engagement of users [13]. Nowadays, multimodal information interfaces which depend on learner active engagement and interaction

have gained considerable research and development interests [7][11]. This trend is expected to continue as designers keep addressing challenges in information presentation such as data overload, interface and performance improvement of recognition based systems, and management of attention process. Most researchers in the field of multimodal human computer interaction system consider system input and output as separate domains. Sarter [11] have classified multimodal interfaces into two groups. The first group combines set of user input modes, such as speech, pen, gaze, manual gestures, and movement of head and hand. One of the objectives of this group is to support functions such as increased accessibility for users and improve performance of recognition based systems [8]. The second group of interfaces serves users with multimedia displays and multimodal system output in several forms, primarily using visual and auditory cues. Therefore, human communication is a two-way, two-level operation [4]. This means that multimodal communication traffic in active systems goes out as well as gets in.

It is important to mention the main themes that design guidelines for multimodal information presentation are mainly organised around. Sarter [11] have shown that the major four themes of these design guidelines involve the following: (1) the selection of modalities where the designer first needs to decide the necessity and/or the desirability of modalities. It important to keep in mind and take into account the user preferences, needs, and abilities [2]. (2) One important step in multimodal interface design is the natural mapping of modalities to tasks and types of information to be presented [11]. For example, speech output should be used for simple short messages that will not be referred to later. (3) The combination, synchronisation and integration of modalities where researchers suggest that combination of media should be minimised and used only when necessary and based on preferences and needs of users. (4) The last theme is the adaptation of multimodal information presentation based on the user. For this, multimodal interfaces require to be flexible and must take in consideration changes in user needs, abilities, tasks, and environment.

These general guidelines themes introduce some shortcoming that researchers still did not handle well. For example, several guidelines propose that modality choices are left to the user whose knowledge about these modalities is very limited. It is obvious that considerable number of research questions remain to be addressed in the field of multimodal information processing such as empirical studies of these modalities at the behavioural, psychophysical, and neurophysiological level [11].

In the context of interactive multimodal process, studies have shown that learners gain benefit from multimedia in the learning process especially when supported by sonification and visualization which improve the process of interactive data exploration [10]. Such a study makes it worthy to study multimodalities and analyze their effects on learners and their engagement and participation in the environment of active presentation.

3. ACTIVE MULTIMODAL PRESENTATION IN E-LEARNING

Despite the drawbacks of online learning, involved learners commented positively on e-learning experience, particularly how much they had learnt [14]. It has to be taken in consideration that students will not collaborate unless collaboration and engagement are facilitated in learning. The main purpose of Active Multimodal Presentation (AMP) is to provide proper active learning environment and to encourage active and effective engagement and participation.

3.1. Active Multimodal Presentation, a New Trend Towards Enhancing Success of E-Learning

AMP as addressed in [3][9] primarily depends on the integration of set of components that form a standalone, free running, short presentations with effective utilization of perceptual modalities of the audience. AMP is able to communicate information dynamically in various forms, i.e. the auditory and visual modes. Therefore, active presentation can be thought as a computer-mediated presentation that provides fundamental human delivery features only available in captured media where static presentations usually lack. This new trend, inevitably, enhances success and usefulness of education achievement especially when gesture is introduced as a third modality along with verbal and pictorial components in a computer based educational presentation.

Therefore, there are three main components to be carefully selected and blended when designing AMP [3]: an auditory component to represent speech, a visual component to represent visual objects, and a gestural component to represent the integrating object. The challenge in AMP is to consider the design principles that suite learner preferences [5] and to integrate modalities to suit the educational context [9]. *"In human communication, the natural integrating object is the*

hand. We use our hands, not only to externalize our internal representations, by scripting, sketching etc, but also to add a gesture component to our communication act that directs attention, provides illustration, emphasizes the contours of the narrative, as well as expressing affect and empathy. The role of gestures, therefore, is not confined to the integration of message modalities, but extends to a social level, which integrates together the presenter and the audience into a socially coherent communication environment. [3]"

3.2. Active Multimodal Presentation Learning Model

Although there has been much work on the use of multimedia technology in education, information is been provided mainly in a textual form. This is still too far from satisfying the human aspiration for lively natural communication, as can be captured in a video medium, for example. In active-like video display, user gets benefit or at least can select between several fixed replay modes. These modes still lack of active engagement and flexible communication with the learner. The main goal of the development of AMP technology is to obtain success of this type of coherent active communication. This is possible with reliance on better use of technology and efficient combination of various requirements that positively attract learners attention as shown in the following model.

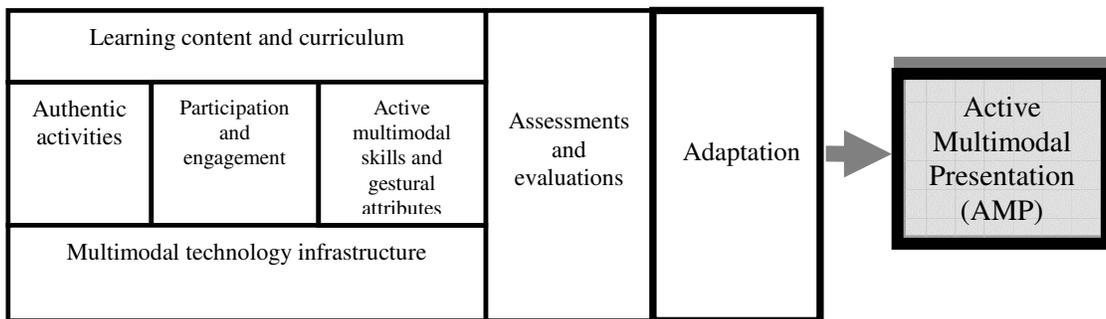


FIGURE 1: ACTIVE MULTIMODAL PRESENTATION MODEL

It is obvious that educational content and curriculum must be appropriately formed and delivered through available multimodal technology tools. Active multimodal skills and gestures motivate learners to engage and participate in higher order of thinking and in performing authentic activities properly.

One major shortcoming that the above model illustrates is the confusion when adapting multimodal settings while interface is running and changing automatically. This issue introduces another research dimension related to learners' preferences, abilities, psychological limits and norms.

3.3. Active Presentation Life Cycle

Unlike traditional frontal teaching, this new type of e-learning mode needs to be depicted and illustrated in generic life cycle model as shown in figure 2. In this model, it is required to select and decide which learning material to adapt in active presentation and determine the scope of student participation. Verification is needed to make the presentation possible based on facts, limitations and abilities. As in any application, final active presentation must be maintained and be able to accept any requested change towards enhancement and evolution. With this in mind, the main general phases include:

1. **Material Acquisition:** Acquire appropriate educational contents that will form the learning module from experts, books, references, scenarios, pedagogical curriculums, etc.
2. **Categorization:** To build active library of related educational components or sets of coherent small components as required.

3. **Modeling:** Formalize complete learning units where set of learning reusable objects are put in a rationale streams that adds knowledge and/or skills. Typically this is difficult step as it encounters required design principles and guidelines, learner abilities and preferences,

presentation performance, and available multimodal technologies.

4. **Verification and Assessment:** Active streams are tested and accuracy is verified through application scenarios with several assessment guidelines. This means that content granules in each knowledge stream within the presentation must be verified and should not conflict with actual order of content granules in the educational material. The set of different active streams in the presentation should conform the correct order of educational streams that form up the intended lesson.
5. **Presentation:** In this phase decisions have to be made about which object streams are to be reused and placed in appropriate modalities to provide actual active learning environment and real interface. According to modeling phase, several modalities are to be used to represent and express learning streams based on rationality of ordering lesson streams. User engagement inevitably affect the behavior of the active presentation while presenting material. The difficult part in this phase is to allow the dynamism in the interface based on active communication and to enable different levels of details to be determined and presented. Various levels of details must be designed and implemented according to learning material, learner preferences, and available modalities.
6. **Presentation Maintenance:** Changes on learning material, gestures, as well as updates and improvements on presentation interface and components are transformed and implemented. This process ensures continued usefulness and enhancement.

Major activities of this phase include four main steps:

- Obtain maintenance requests in order to update and improve current presentation.
- Transform requests into changes.
- Apply these changes into design.
- Implement required changes into current presentation.

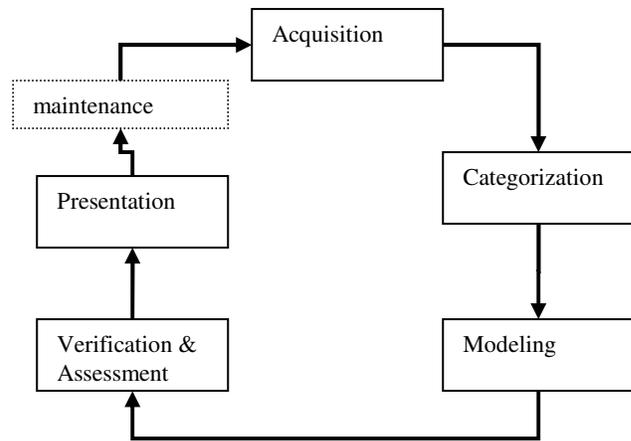


FIGURE 2: ACTIVE PRESENTATION LIFE CYCLE

3.3. Active Engagement of Learners

Until the near past, most lectures and demonstrations are built and performed as teacher-centered process. In this process teachers use traditional methods of teaching and support learning modules with some inactive Multimedia technology [7]. The drawback of this strategy is that the teacher always play the source of knowledge side while the student role is just listen and try his/her best to digest received knowledge and information to some level. Other practical skills are gained during demonstrations in the practical lessons. The trend nowadays is to move from traditional methods of lectures and demonstrations towards enhancing the process of knowledge and skills acquisition and retention of knowledge. This trend is assisted by active presentation which drives learners to more active engagement and interaction. Therefore, active learning is an effective teaching strategy that enhances engagement of learners in order to develop competencies and build skills rather than getting satisfied by acquisition of limited presented knowledge. Proper integration of multimodalities and right assignment of learning contents to correspondent modalities along with learner engagement, as shown figure 2, lead to produce efficient AMP learning modules.

4. TAKING STEPS

Overall, addressing issues of e-learning improvements is long alterable process requires some fundamental re-thinking about learner role in learning and use of modalities to serve better education. This requires some orientation in the model of active e-learning where learner should participate in and contribute knowledge to the class. Making this improvement possible requires

intensive use of adaptable multimodal interfaces with specific concern of visual, auditive and gestural human perception channels. Available traditional software tools are adequate to create appropriate AMP learning modules. Such software tools that may fulfill the needs, are PowerPoint, Flash or Director, screen capture utilities in addition to some other multimedia technology tools.

Educational contents are usually organized into sets of coherent small paragraphs that suit the educational module with set of subordinate educational components within the same context. These subordinate educational components should be enhanced with gestural and other explanation forms. After presenter form a complete tested and justified presentation, learners can actively engage in the display of the presentation.

The more subordinates used in the same educational context, the more ways the educational material could be presented which means more level of details learner can go through. Good AMP provides knowledge to learners, directs user engagement and interaction, and reads preferences in a way that it does not add too much responsibilities on learners.

5. CONCLUDING REMARKS AND FURTHER WORK

This paper addresses the challenge of using the technology of multimodalities and active learner engagement and interactive participation. New opportunity exists towards enhancing active multimodal e-learning with more active learner engagement in the cycle of AMP. With this new trend, presenters in education communities are motivated to move from traditional methods of lectures and demonstrations towards active education. This trend, enhances the process of knowledge acquisition, retention of knowledge and acquisition of additional skills and knowledge through active presentations. AMP, therefore, drives learners to more active engagement and hence better knowledge retention and achievement. With the new configurations, students and teachers are able to provide learning spaces that motivate active and collaborative educational environment. This process, in fact, does not ensure easiness or hardness of teacher role in e-learning, but, in order to become more rewording, it adds more responsibilities on all parties. Teachers always play the vital role in continuous improvement of presentation quality concerning content correctness and sequence, correct use of suitable modalities, and other roles to motivate active engagement and participation.

This results in more effective support towards expanding thinking potential, contributions and self-learnability of learners.

Further work includes evaluation of possible use of various gestural attributes within verbal and non-verbal communications that enrich active engagement of learners. An important imperial research relates to the study and evaluation of the level of learner engagement and its impact on the learner achievements, behaviour and psychology through actual case study in active e-learning environment.

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