

# Media Selection and Design: A Case in Distance Education

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## Abstract

With the development of the new technologies everyday, the selection of the most effective and efficient media in education becomes more complex. This paper, thus, describes common media selection models and suggests strategies for the design of media combinations for a better learning. Indeed, the paper is concluded with the media design implementation in a distance education case.

## Introduction

According to Bates, “*medium* is a form of communication associated with particular ways of representing knowledge” (1995, p. 2). Clark classified the social-psychological definitions of educational media as vehicles, vehicles plus teaching method, and learning context. Media is also viewed as context where education occurs, much like research on schools or homes as settings for educational experiences (2001).

Lambert Gardiner (2002) categorizes the exploration of media into four generations. The first generation, memory and speech, is the media type that is just done by people. The second generation of media is print and film, which was invented in last century. With a big shift, the previous generations assimilated with the new generation telephone and television. After a while the speed of the progress in media development was incredible and the fourth generation, multimedia and the Internet, became popular. It seems that the fifth generation is the multifunctional mobiles and web systems.

There are various types of media with their own unique characteristics. Dorr and Seel categorize media as instructional media and mass media (1997). According to them mass media aims to entertain, while instructional media falls within Gagné and Reiser’s definition (1983) as the physical means by which an instructional message is communicated. John Fiske divides media into three main groups; presentational, representational,

and mechanical (1982). He describes presentational media as face, voice or body communication – in other words, both verbal and nonverbal communication in a face-to-face relationship. Representational media exist once they have been created even without further human involvements, so this group includes writing, painting, photography, music composition, architecture and even landscape gardening. Mechanical media are used to transmit communication. Some example of mechanical media can be listed as radio, television, video, cinema, the press, and telephone. Within educational perspectives, media should not be divided to these sub groups since desired media in the instruction context should contain presentational, representational and mechanical characteristics. Even though the media types might be listed in different categories, the main classifications are similar. For example, Smith and Ragan (1999) separate computer medium from interactive media while Romiszowski (1988) goes more in detail and divides them in to sub-groups such as computer media and other visual media.

## Media Selection Models

It is obvious that the types of the media will not be limited with the fourth generation types that Gardiner mentioned (2002) and the new type of media are on the way. These new media types bring more capabilities for human beings to communicate more effectively and efficiently. However, each new medium makes the media selectors’ job harder. How should educators and trainers go about selecting media? A number of media selection models have been developed in an attempt to answer this question.

In the 1970s to 1980s there was a rapid development of media selection models. Interestingly, there are not more than few models that were suggested before 70s and or after 80s. Since the designing of media selection models was nearly simultaneous, according to Romiszowski (1988), there are many similarities among the

models. Some of the main differences, however, between these models are the methodology of task analysis to define the instructional objectives of the lesson, and the instrumentation and type of job aids used in the selection process.

The most common form of instrumentation used is some form of matrix, which crosses specific media with specific instructional functions or practical benefits and Gagné model is an example of this type (Reiser & Gagné, 1983). Allen's model (1967) is another example. A different approach is to use some form of worksheet which guides the selection process as a checklist and documents the designer's decisions in a standard form. The third common approach is the use of a flow chart, or algorithms, to guide the selection process. Some new models in 80s such as Resiser and Gagné model (1983) and Romiszowski's model (1988), which use a worksheet as well as a set of flow charts, are organized in form of a matrix.

Coulter and Sarkis listed four main factors of media selection and each factor has its sub factors to evaluate the media (2005). In this model media pass through the first filter, which is quality, and the sub factors of quality are attention, simulation, content, credibility, and clutter. The second filter is time that has exposure and leads time as sub factors. The third one is flexibility that has appeal, personalization and interactivity as detail factors. Coverage is the fourth factor and this factor has selectivity, pass-along, frequency, and reach. The last of the factors is cost and development. Cost and delivery cost are the sub factors that should be considered during the selection.

Each selection model was created by the designers depending on their media selection criteria. For example, A. J Romiszowski (1989, p. 94) classified the criterion of media selection into four main concerns. These criteria are: (1) effective communication which can be related to content, objectives, and learners (2) reasonable cost which can be related to objectives, market, and availability (3) practical tool which can be related to availability, time, and facilities and (4) human factors which can be related to facilities, teachers, and learners.

On the other hand, Barnes, Mosgrove, and Rassouli (1982) list the following media selection criteria: (1) define the objectives (2) availability of

the media in the targeted area (3) uncontrollable factors such as government restrictions (4) the behavioral aspects of targeted customer-learner- (5) appropriate media to effectively convey the message (6) considering the cost factors of candidate media. Coulter and Sarkis (2005) list the factors of media selection as (1) quality, (2) time, (3) flexibility, (4) coverage, and (5) cost.

Tony Bates's ACTIONS model is one of the clearest criteria for selection of media (Bates, 1995). ACTIONS is an acronym for access, costs, teaching and learning, interactivity and user-friendliness, organizational issues, novelty, and speed. In contrast to other models, Bates' model focuses on media selection in terms of current technology. Some questions to consider when selecting media include the following (Bates, 1995, p. 1):

A-How accessible is a particular technology for learners?

C-What is the unit cost per student?

T-What are the best technologies for supporting this teaching and learning?

I-What kind of interaction does this technology enable?

O - What changes in the organization need to be made?

N - How new is this technology?

S - How quickly can courses be adapted with this technology?

### **Learning Outcomes and Media Selection**

Gagné (1977) outlines the relation of learning objectives to appropriate instructional designs. Five major categories of learning were identified: verbal information, intellectual skills, cognitive strategies, motor skills and attitudes.

**Verbal Information:** One of the largest parts of instruction, verbal information, can be explained with such examples reciting the presidents' names or stating the definition of a term in biology class. With this point of view, Reiser (1983), supports the relaxation of the need for feedback precision and makes possible the use of a wider range of media for verbal knowledge than is the case for intellectual skills.

**Intellectual Skills:** Intellectual skill can basically be explained as knowing how to do something. According to Reiser (1983), the most important

characteristics of intellectual skills learning is its requirement for precise corrective feedback therefore the media for these skills learning should be considered for having feedback functionality.

**Cognitive Strategies:** Cognitive strategies are manners in which learners guide their attending, learning, remembering, and thinking. Media having interactive properties are therefore required for cognitive strategies.

**Motor skills:** Motor skills are described as the ability to do precise, smooth, and accurately timed performances with muscle movements such as making origami. Accordingly, what is needed as a medium is the real situation, the real equipment, or a realistic simulator and therefore the media selection should be rely on informative feedback during practices Reiser (1983).

**Attitude:** The essential media characteristic for attitude learning is the display of human model in the process of making the desired choices, and model's satisfaction with the consequences of those choices. For this kind of learning, media should be able to present realistic picture of human model and the model's message.

Related to learning outcomes, Edgar Dale's Cone of Experience (1969) visualizes where each media types go into learning. Dale constructed this illustration to communicate the idea that learners will find greater success within more abstract media-supported instructional experiences if they are built upon a greater number and variety of more concrete experiences.

### **The Case: Media Selection for Distance Education**

In this section of the paper, the background of the setting, media selection examples in distance education, and a proposed solution for media combination were listed.

#### **Description of the Environment**

The Pennsylvania State University's long tradition of leadership in distance education, starting in 1892, provides professional educational opportunities for students from all around the World. Students from every state in the United States, from more than 40 countries around the world, and from every continent are currently enrolled in the World Campus courses. Over the

years, courses were delivered with many technologies, from via radio in the 1920s to an on-campus interactive television network in the 1950s, to the use of public broadcasting and cable television. Since the 1980s, distance education programs have exploring new technologies for its courses.

There is a large range of media available for distance education, which raises the question: which media is the best? The simple answer to this question is that no media is better than another. Further, there is agreement that a media combination may often be more effective and efficient than any single medium (Schramm, 1977) and there is no single most effective media combination for all situations. According to Truelove, distance education is usually carried out in one of the following three ways: (1) through a single medium, (2) through a master medium and with other reinforcing medium and (3) through multi-media (1998, p. 3). In this project, a variety of media types were tested and the most effective tools were combined to improve students' learning. Even though, variety of new technologies are available for distance education, math based courses in this institution were still using traditional mailing method for delivery of instruction and assignments. The main reason behind this is the new technologies were not effective and efficient enough for graph drawing and other equation writing. Thus, the following steps of similar to ADDIE instructional design models were followed for media selection process.

**Analysis:** Learner characteristic is the most important analysis part of this phase, Smith and Ragan (Smith & Ragan, 1999) listed four main learner characteristics with their sub specific characteristics. Depending upon instructional task, some characteristics might be more critical than others. The following list contains learner media characteristics among the major characteristics that should be conducted in analysis:

Cognitive characteristics; general media aptitude, language development, level related to media usage, reading level, level of visual literacy cognitive processing style, specific media prior knowledge

Psychological Characteristics; general health, media accessibility, age

Affective Characteristics; interests, motivation, attitude toward media usage, academic self concept, anxiety level, beliefs, such as not using any technology tool in the learner's belief, locus of control

Social characteristics; tendencies toward cooperation- for online team work, socio economic background- effort to purchase the material, racial ethnic background, media usage and ethnics, role models

Content Analysis; learning outcomes, and instructional goals and objectives

Media Analysis; computer resources for design and learners, the web, CD, hyperstudio, book, etc. and ensuring all students do their own work, teaching of the web concepts, computer literacy, etc

Constraints; learner age, time, resources, media accessibility, cost

Competency; accuracy in completing assignments, worksheets, quizzes, etc.

Timeline; including management, and assigning tasks and flowcharting

**Design:** During this step, the available media, after passing the analysis filter, should be designed and combined. The following criteria should be kept in mind during this process;

- Is there interactivity? If so, how is it used?
- Describe the user options that are available throughout the program.
- Will there be feedback from the software to the user? If so, where?
- Will the content progress from simple to complex issues?

**Development:** This phase is the process of authoring and producing the materials needed for learners to meet the objectives. This process includes: developing session plans, trainer guides, learner guides and trainer and participant resources, trainer and on-the-job aids, coaching/mentoring guides and resources, technology infrastructure and software, participant assessments, and project and program evaluation instruments. In this phase, materials are produced according to decisions made during the design phase. Documentation is prepared and the product is ready to be tested.

**Implementation:** With the project ready for delivery, the learning environment is prepared by training the facilitators and learners, and placing all tools for full implementation. In this phase, some of the following task can be implemented:

- Produce program materials and aids
- Install technology infrastructure and services
- Install on-the-job aids
- Set up venue and accommodation and schedule participants
- Conduct training sessions and implement training transfer strategies for media usage

**Evaluation:** This phase consists of two parts: formative and summative. Formative evaluation is done during the whole process. On the other hand summative evaluation is done only at the end. The feedback gathered during formative evaluation is designed to fine-tune the implementation of the program, gather reaction and identify what is not working. Summative evaluation provides information on the media's effectiveness. For example, did the learners achieve better when the media A is used? In a sense, it lets the learner know "how they did," but more importantly, by looking at how learners' did, it helps the institution or teachers know whether the product does what it is supposed to do.

In this case, only the analysis and design phases of the media selection process were implemented. For this purpose, there were interviews conducted with instructors of target courses. The learners' attitudes toward technology use were obtained from the institution. For the content analysis, three main math textbook published for distance education courses were borrowed from the department in order to conduct the content analysis. Instead of analyzing at the development step of instructional design process, such existing media as WebEQ, ANGEL HTML editor, scanning/PDF were analyzed at the analysis step. During this specific part of media analysis process, cost-effectiveness, readability, equations, graph, and time to enter information were other topic are examined.

During the selection process, not only the media that World Campus uses but also other new innovations such as SmartBoard technology, Macromedia Captivate, SmartThinking, Apple Keynote, Mimio, and Beams technology were analyzed and tested for the purpose of the project.

There were other tools tested and not recommended because of such limitations, cost and time. These courses were aimed at students from all around the world, the traditional method, face-to-face instruction, was not eligible. For that reason, the main option for selection was media that provides an online learning environment. Specifically, there are some tools to publish math based courses online. Some of these tools were also tested for the purpose of the project. However, the limitation of the functionality and cost didn't allow us to add these tools in our final solution.

In addition, there were two technological tools, Wacom Graphire and Belshazzar, that were simple but functional for math-based courses. Graphire gives the control to edit digital photos quickly and easily. This tool let the users draw, paint, craft projects, and slide shows. The users comfortably jot notes, annotate documents, sign their name, sketch quick diagrams, and draw complex math graphs. Belshazzar is a multimedia tool consisting of a tablet with pen, microphone, and a PC. When you write on the tablet with the provided pen, the diagram, notes, etc. get recorded in a session. If you use a microphone, you can give audio notations or descriptions as you are writing, and the audio information is recorded in sync with the drawing. When the recording is complete, the user clicks "Pause/Stop" button.

As the paper was titled, this project did not just focus on selecting the most appropriate media for the instruction, but also focused on efficient delivery of instruction. Opposite to traditional selection we did a front-end analysis and the media were not just selected but also designed. Overall, a simple scenario of education setting is as follows;

The instructors create instruction with Belshazzar tool and upload on course page where all students can access to content anytime. The voice can be recorded to help students understand the steps. For the assignment submission and revision, the instructors may open the students' PDF files with Wacom Graphire and make correction if necessary.

The corrected assignments will be reuploaded on the course page and the students are able to review how they did on the assignment. After the instructor gets assignments from all students, she/he will post the solution to each question on ANGEL CMS. With that way, we prevent wasting time, increasing cost but increasing learning by fast and clear communication.

### **Conclusion**

The attempt to select the best combination of media for education is an on going process. The selected media may not be the best choice for all circumstances. However, the selection process and selected media in this project to be the most appropriate choice in current circumstances. Not only with the new trends toward web based learning, but also with all criteria and pros cons, it is strongly recommended to use computer centered media. Overall, it seems that the solution provided for Penn State World Campus was the most appropriate selection for that time. Not just because the research supports Web based learning, but also because other media selection criteria such as cost, speed, interaction, animation etc. are also provided in this selection.

In conclusion, media should be a mean to an end not an end in itself. The focus of educators should be designing best environment for teaching and learning. Media, obviously, is one of the most important components of this environment. Thus, education communities should have a clearer understanding of the various media characteristics, learner related issues, problems associated with media selection, and determining the proper approach for media selection. There is, unfortunately, a bias against media types called media bias. A media bias may arise from a high level of familiarity with a particular media, lack of interest in utilizing another media etc. In order to avoid a bias for a particular medium, the focus of the designers and instructors should be teaching and learning rather than looking for the most popular technology.

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