

# **Wetlands in Coastal North Carolina: a Multimedia Education Program in Progress**

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*Abstract:* Thousands of multimedia titles are being developed for education purposes, many on environmental topics. Learning potential is very high, because if a program is engaging and interesting, people will spend many hours with it. Ariel Training Design and the U.S. Fish and Wildlife Service formed a partnership with 28 local, state, and federal agencies to develop an interactive multimedia educational program on wetlands in coastal North Carolina. The project is in progress. The goal is to develop a high-quality program based on solid educational principles to teach people the ecology and value of wetlands in coastal North Carolina. Existing resources, such as video, will be incorporated where possible. The final product will complement other education programs, including workshops, print materials, and traditional video. Multimedia is a challenging endeavor because of the complexity of the various components and the infinite number of ways to present any piece of information. There are drawbacks: one would be to treat multimedia like another medium without tapping its potential. Another is to become enraptured with its capabilities and end up with all flash and no substance. Although multimedia is a blend of traditional media, it is unique and should be designed with its unique requirements in mind. But the goal is the same—to provide sound instruction on well-defined subject matter to meet stated learning objectives. This paper presents the process that is being followed to develop the program.

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## **Overview**

There is a lot of interest these days in educational multimedia, which is computerized instruction that integrates text, still images, sound, animation, and video. A dazzling array of CD-ROM programs, called titles, feature topics ranging from the history of the world to Beethoven's symphonies. Environmental topics include whales, sharks, national parks, dinosaurs, the solar system, coral reefs, bugs, animals in the zoo, and an encyclopedia of nature. More and more CD-ROM titles are available every day, and more and more people have

access to them. Ignoring what amounts to a revolution in communication and education will leave you and your agency in the dust, so to speak. All of which does not mean that workshops, videos, manuals, and outdoor education programs are outdated. They are just as viable as ever. What it does mean is that you have another, persuasive avenue through which to reach your constituents. Multimedia, if well-designed, can reinforce and complement existing and more traditional methods of education.

The topic of wetlands is included in many state environmental education programs. Wetlands are important for wildlife, water quality, and fisheries, and are not only endangered by development and pollution, they are threatened by political redefinition. In addition, they are at the crux of the debate on individual property rights and habitat restoration and mitigation. There is a lot to learn about wetlands, some of it potentially confusing. Multimedia is a powerful teaching method because it can provide in-depth coverage of a topic, use different media simultaneously, engage learners actively, and demonstrate difficult concepts graphically. Multimedia instruction can reinforce what people learn in a museum, encounter on a nature hike, see from their car window, or read about in a book. Multimedia is no substitute for going outside, but it can take people to places that are inhospitable, dangerous, fragile, or simply inconvenient. Multimedia can motivate people to learn more about wetlands by giving them control over what they learn and allowing them to proceed at their own pace. Well-designed multimedia is interesting and engaging as well as educational. Students will take the time to interact with a program they enjoy.

With these ideas in mind, the U.S. Fish and Wildlife Service (USFWS) and Ariel Training Design, an independent multimedia design firm, set out to develop an interactive, educational CD-ROM program on coastal wetlands in North Carolina. This project is in progress. This paper will describe the first stages of development.

## **Development Process**

The development process we are following consists of 6 major steps:

- I. Planning
- II. Analysis
- III. Design
- IV. Preproduction
- V. Production
- VI. Evaluation

### **I. Planning**

Planning is a key component of success. Planning gives you a goal to strive for, a "road map" to follow and a set of "tools" to use in the process. Planning is particularly important for multimedia development because of the complexity

of development and because mistakes can be very costly. So, your first step should be to draw up a development plan. You should include the following components: need, goal, objective, audience, description, development strategy, delivery platform, budget, project schedule, and distribution method.

#### Need

This is the justification for your project. A needs assessment can be a major undertaking, but even if you do not conduct an extensive analysis, spend some time determining why the project is needed and how multimedia, which can be costly and time-intensive, can fill that need. We felt that multimedia would give us an edge to reach more people who might not otherwise learn about wetlands. We also felt it was an opportunity to test new educational technology.

#### Goal

This is a broad statement of your purpose. Our goal is to “educate the public and youth about wetlands within USFWS Ecosystem Unit No. 34 and to foster in them a sense of appreciation, stewardship, and personal responsibility for important watersheds and coastal wetlands in North Carolina.”

#### Objective

This statement indicates how you are going to attain your goal. Our objective is to “develop an engaging and interactive multimedia education program using CD-ROM technology on coastal wetlands in North Carolina that can be used at home or in schools.”

#### Audience

These are your students, to whom you specifically target instruction. When the program is designed, it should be designed with the target audience in mind. Programs that cover the same content will vary greatly depending on the target audience. Multimedia can be designed to accommodate a broader spectrum of learners than traditional forms of instruction because of the ability to branch and to integrate different levels of learning. You may not have much control over who uses the final product, so you may want to target as diverse an audience as possible. The audience for this project is “middle school students through adults in the general public who do not have specialized or professional wetland expertise.”

#### Description

This is a general description of the content and instructional strategies to be included in the program. If possible, identify any specific media pieces that will be required. Our program will have an interactive map showing locations of different types of wetlands people can visit in eastern North Carolina. Another activity will provide a detailed graphic of a salt marsh that you can explore to learn about the plants and animals that live there. We will also include short

video clips, graphics, animations, and other interactive activities that teach the definition and types of wetlands, benefits of wetlands and the impacts of human activities on wetlands.

### Development Strategy

This is the process you follow to develop the program. It outlines step-by-step how you will achieve your objective. Our strategy has the 6 major steps outlined above.

### Delivery Platform

You should pin down your delivery method, such as CD-ROM, CD-I, or Videodisc and delivery platform, such as Macintosh, PC, or UNIX as early as possible. You will also need to determine your minimum system requirements. Knowing your audience will help make this determination. If you design for the lowest common denominator, your program may be limited. On the other hand, you don't want to develop a program that few people will be able to access. A kiosk or stand-alone display should use the most sophisticated set-up you can afford. If you are targeting schools, find out what's being used or what will be used a year from now and go with that. Most home users have a PC, but in North Carolina, most schools use Apples and Macs. What you select will influence your cost and design as well as your selection of development software.

### Budget

Include an estimated budget in your development plan with some degree of flexibility. The price of multimedia can vary from a few thousand dollars to several hundred thousand dollars. Variables that affect budget include availability of existing materials, scope of program, amount of material, number of graphics and animations, amount of video to be digitized or produced, amount of sound, degree of interactivity (which influences the complexity of the programming), number of copies, and packaging. There are numerous options within each of these areas. Consider whether you have content and instructional design expertise on your staff or whether to include that cost in your budget. Because multimedia is a mesh of different media types, it can be difficult to budget. It is often easier to work backwards, that is, determine a budget and then see what you can get for it. You may want to cover less material, but have more interactivity and animation. Or you may want to cover more content, but make it less elaborate.

### Project Schedule

Six months to a year is a common time-frame for a multimedia project from beginning to end, but it can be done quicker or may take longer, depending on a number of factors. If you have existing materials you want to convert, it will take less time than if you are researching a new project from scratch. Developing partnerships with other agencies is a great way to pool resources and share expertise, but it will probably increase development time. If you plan well and

stay on top of the development process, you will avoid problems and delays later on, which would also increase your cost. You can save time and money if you review materials under development carefully at regular intervals, before they are produced on computer. It is a good idea to sign off at successive stages to avoid the tendency to make changes later, which will extend production time and cost. Be sure to allocate adequate time for planning and design. Changes are easier, quicker, and cheaper to make early in the development process than during production. Production is the most costly stage of multimedia.

#### Distribution Method

Consider how you are going to distribute the final product. If your agency already has a store or catalog, that may be your primary distribution mechanism.

#### Team

Before you get too far along, you should assemble your development team. One of our objectives with this project was to form partnerships with a number of state agencies in North Carolina. We wanted to draw on the tremendous expertise within the state and allow everyone to learn from the experience. We assembled a diverse team of 35 educators and scientists from 28 local, state, and federal agencies. The members of this team help gather information, review development materials, provide content expertise, attend meetings to discuss design strategies and do some writing. A multimedia project is always a team effort. Most projects require about 5 or 6 people, who may have multiple roles. Every project should have team members to fill the following responsibilities:

- client—provides direction and funding, signs-off
- team leader/project manager—coordinates the project, maintains the project schedule
- content expert(s)—determine content, review materials under development
- instructional designer—gathers information, designs the program
- graphic artist(s)/animator(s)—design screens, develop graphics and animations
- programmer(s)/author(s)—code, test and debug the program
- one or more media producers—develop video, still images and sound

If you contract with a firm specializing in multimedia, most of these roles can be handled by the firm. In our project, the USFWS and several North Carolina state agency partners serve as the client and content experts, UNC Center for Public TV serves as video producer, and Ariel Training Design provides the remaining services.

A CD-ROM can include an extensive volume of information. Content experts are a pivotal part of the development process. Without solid, accurate and substantial content, your program will have little success. Our strategy was to allow any of the government agencies involved in wetlands management and

education to be involved. For us, this strategy works well because no one person has to devote an extensive amount of time. We benefit by having a variety of perspectives and lots of input. The downside of this is that a large team is difficult to manage logistically and extends development time. Also, it may be challenging to integrate differing perspectives from the different agencies.

During each stage of development, appropriate and skilled personnel should be involved. Instructional designers should design, graphic artists should develop graphics and programmers should program.

## **II. Analysis**

The analysis stage is mainly a matter of determining the content of the program. If you are developing a program from ground zero, this can be a lengthy process. If you are adapting an existing program, much or most of this stage will have already been done.

### **Acquire Existing Materials**

Part of the process of defining content is determining what's already been done. We began by collecting existing wetlands educational materials from government sources. These included activity guides, scientific documents, brochures, videos, books, articles, and posters. Materials collection is an important step in instructional design and will save time later during development. Existing materials will indicate what is already being taught and how. They can be used as references during development and resources during production. Some materials can be adapted for use in the program in the spirit of not recreating the wheel and stretching resources. By doing this research now, you'll be better prepared to design the program around what's available or what you can afford to purchase. Collecting existing materials starts early, but may continue throughout the project as your content becomes better defined.

For example, we developed a short component on dragonflies. We found some existing video footage and photographs that we digitized, wrote a short script from information we gleaned from several articles and designed the computer screen to be visually appealing and user-friendly. Sound will be added to enhance the experience and engage more senses. Multimedia is a new and different delivery medium. Unless materials are simply going to be stored on the CD-ROM, they need to be adapted to the new format, as well as digitized. Digitization alone will do nothing to enhance the instructional effectiveness of educational materials. In fact, it may detract. A book, for instance, is easier to read in book form than on a computer.

### **Conduct Kick-off Meeting**

Once we recruited individual team members, we held an all-day kick off meeting. The purpose of a kick-off meeting is to jump-start the development of your project. You need to bring team members up to speed on the project, clarify roles, and discuss your development plan. In the process you can reaffirm

your goals and objectives and further define the scope and content of the program. To meet this goal, we presented an overview of the project and then broke into small groups. Each group was assigned a major topic: definition and location of wetlands, ecological roles of wetlands, importance of wetlands, and threats to wetlands. Groups brainstormed, analyzed their topics, wrote learning objectives, and identified tentative design strategies suitable for multimedia. Then they presented their work to the rest of the group. These ideas were written up and redistributed to the team.

### Develop Content Map

A content map is a flowchart of the major topics in the program and their relationship. It depicts the “big picture.” The structure and navigation of the program is emerging at this stage. Individual modules are identified that encompass the main concepts. Each module can be accessed independently and, in essence, is stand-alone. Modules then branch out into smaller components that cover specific ideas and issues. Tentative media treatments are represented as well. Some sort of visual representation of the basic design strategy is needed to keep the program from becoming unwieldy.

### Define Learning Objectives

An important step in the development process is identifying specific, measurable objectives the learner will achieve by taking the program. This is a basic tenet of instructional design and enables you to focus on content that directly relates to the objectives. If content is included that does not support an objective, it can be deleted. Otherwise, an objective should be written for it. Objectives may evolve with the program, but a solid set of objectives is one of the secrets of effective instruction. Objectives guide design and development. They are not usually included in the final program, unless it is being developed specifically for schools. Objectives also provide a way to evaluate the success of the program. A few objectives from our program follow:

- Name and describe three common wetland types in eastern North Carolina.
- Identify three characteristics that can vary in different types of wetlands.
- Describe three ways plants or animals have adapted to the salt marsh habitat.

### Develop Content Analysis

Once you have identified your main topics and specific learning objectives, you analyze the content, breaking it into all the detail you plan to include in the program. This is the most laborious part of instructional development. You should end up with a detailed outline of every concept, fact, or procedure in the program. Because the amount of content can be extensive, you may want to start designing the program as you flesh out the content. It will also help you start thinking in a non-linear fashion.

### III. Design

Once you've defined the content, you are ready to design the program. The end result is a design document.

#### Design Document

The design document describes the major concepts and technology that will be used in the project. It will be revised as you progress, but gives direction and movement to the overall vision of the project. To save time we developed the content analysis and design document simultaneously. As you develop this information, you may want to meet with your team to brainstorm and flesh out ideas and write up design specifications and text components. This is an iterative process and involves several reviews and revisions. In our project, we conducted a series of design meetings to continue the work begun during the kick-off meeting and to assign small pieces to individual team members to research and develop. Team members sent in their assignments, which were incorporated into the content and design document. As modules are completed, they are sent to the team for review. Revisions are made as comments are received from the team. As issues arise, additional meetings are held to try to resolve some of the issues. Issues may concern content or design.

For example, one activity allows you to compare common objects to wetland benefits. Without some previous knowledge of wetlands, this activity is difficult, but students are not required to learn anything before going directly to this activity. To allow this flexibility and to address the design concern, we redesigned the activity so that behind every benefit is a hint. You simply click on the word to see the hint, and also learn more about the benefit. For example, if you could not relate the benefit of "waterfowl stopover" to a picture of a "bed," you could click on "waterfowl stopover" and receive the following hint: "Ducks, geese and many other species of waterfowl use wetlands as a place to rest and feed during their long migratory flights." When you make a correct match, you are "rewarded" with a sound effect, in this case snoring.

Examples of content issues in our program include the definition of wetlands and wetland types. At the time of this writing, the U.S. Congress had not determined how many consecutive days of standing water a habitat must have to be considered a wetland. Some habitats we have defined as wetlands may not be considered wetlands with new legislation. We also discovered that there is some degree of variation in terminology and delineation among various governmental agencies regarding wetland types. Content and design issues should be resolved early on during the design phase.

#### Design Considerations

Interactive multimedia education is essentially a new way of thinking and learning. Kids already know this. Put children in front of a multimedia program and off they go. They don't need instructions. They expect to explore and discover. They expect to interact, make decisions, and have fun. They know they



are in control and can choose where to go. Sure they may learn something, but it better be fun. This accounts for the proliferation of “edutainment,” which is learning that is entertaining. Adults are still figuring it all out. Put them in front of a CD-ROM and they look for instructions. They expect a step-by-step approach. Doesn't B follow A? Not in multimedia. At least, it doesn't have to. With the graphics, animation, and interactive ability of computers, there's absolutely no excuse for a book approach to multimedia. It should be designed to be modular, multi-sensory, non-linear, interactive, and self-paced. However, this takes careful planning and design as well as imagination and creativity, time, and money. Most CD-ROM education programs try to have a good mix—different levels of interactivity, various media components, and a variety of presentation strategies. But the basics are still important. Content drives design. Content should be accurate, substantial, and meaningful and should be based on learning objectives. The program should be geared toward the target audience. Sound instructional design principles should determine design strategies.

For example, our program includes a short segment on tides because of their importance in coastal ecosystems and a general lack of public understanding. The segment depicts a color graphic of the earth, sun, and moon and then animates the moon orbiting the earth, creating a tidal bulge as it goes. A voice-over describes the process. To explain spring and neap tides, we allow the student to move the moon to different locations around the earth to see what happens to the tidal bulge. At the same time, they see a picture of how the moon looks in the sky during that part of the month. The more difficult, confusing, or important a concept, the more it warrants a sophisticated treatment. Showing non-educational components, such as menu options, dancing and singing may be entertaining and in that sense, motivating, but it may use up resources that could more appropriately be applied to instructional elements. The term for inappropriate or overuse of multimedia elements is gratuitous multimedia.

#### **IV. Preproduction**

##### **Collect or Create Media**

You may have already acquired some media, such as video, slides, or sound, you can use in your program. Other media components you would like to include should be identified as early as possible, at least tentatively. Determine if the media are available and how to obtain them. Start acquiring them as soon as possible. You may also have to deal with copyright and acquisition issues, which can be a lengthy process. If the media you want don't exist, you can have them developed or revise your design to work around what can be obtained. CD-ROM often has hundreds of very short media segments.

##### **Storyboards**

Storyboarding can be done onscreen or on paper. It allows you to identify all the elements of each individual screen. A storyboard describes what happens on screen, identifies media elements like video, sound, and animation, contains

the text or script, and includes a rough sketch of how the screen will look. Storyboards can help avoid confusion during production.

### Prototyping

Prototyping allows developers to test out design ideas before a major commitment is made. It is a quick and dirty trial on computer, which can be started even before the design document is finished. How will the ideas you've identified on paper work on computer? How will people navigate through the program? How will the graphical user interface look? What kinds of icons and learner control features will be included? Sometimes design decisions are best made through trial and error. This gives the developer an opportunity to experiment without investing too much time. A prototype is a rough sketch of the program with some functionality.

## V. Production

Once the design document is completed and approved and the media elements created and designed, your program goes into production. The majority of the work will be accomplished by graphics artists who design the interface and individual graphics, authors who specialize in the particular software authoring tool being used, animators, and programmers. The development team should meet at regular intervals to track progress and resolve any issues that arise. Invariably, no matter how solid your design, changes will need to be made as the program takes shape on computer. Testing the program for bugs will also be an ongoing process during this stage. Another consideration is the creation of artwork for the CD-ROM disc and its packaging. When production and testing are complete, a temporary CD-ROM can be pressed. This first-run disc can be used for further testing and evaluation. Eventually a glass master will be made, from which any number of duplicates can be pressed.

## VI. Evaluation

During development, you should have regular reviews by content experts and educators for content and design. The purpose of this is to ensure you have accurate, appropriate content and that your design will work instructionally for the target audience. As soon as possible, you should test the program on a typical group from your target audience. Do they like it? Can they meet the stated objectives after going through the program? Be sure to provide enough time in the project schedule for testing and debugging as well as evaluation. Even if an elaborate evaluation strategy is not employed, some form of evaluation will ensure greater success for any type of instructional program.

**Summary**

Multimedia development is a challenging endeavor but with proper planning, methodical design, and a professional team, you will have a product well worth the effort. Multimedia education can teach and entertain consistently and untiringly. It can be used as stand-alone instruction or as a component of classroom and workshop training. Although developing multimedia programs seems costly, the per student cost is usually much less than many other forms of instruction. As computers become more ubiquitous, multimedia education and communication are becoming more commonplace. Many more people will be receiving instruction and much of their information from the computer.