The Design of an Interactive Goal-Based Scenario Program on Ecotourism

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Abstract: The problem of designing a pedagogically rich interactive multimedia program on sustainable development called *The Last Resort* was addressed by integrating a goal-based scenario design framework with the interface design. The constructivist orientation of such a framework enabled the interface and instructional designer to provide a technology-supported learning environment where students learned key aspects of sustainable development by direct manipulation of different program functions and simulation and investigation of alternative scenarios.

Background

Recent advances in digital technologies offer teachers today an array of innovative tools and resources which can help them respond to students' diverse learning needs. For Environmental Studies, Social Studies and Science teachers, the genre of interactive multimedia presents exciting opportunities for the development of the students' understanding of critical issues in environment conservation. In particular, the simulation form of interactive multimedia enables students to gain instant feedback about the effects of their decisions and actions on the environment.

In the Philippines, such simulation programs are not readily available to environmental studies teachers. Moreover, programs which are situated in the real life experiences of communities faced with the challenges of sustainable development are much more difficult to obtain. In response to this need of providing locally-contextualized materials, an interactive multimedia simulation program called "The Last Resort" was designed to help students in secondary level and tourism majors in tertiary level to examine the inter-relationship of environmental protection, ecotourism and sustainable development.

The Design Problem

Critics of simulation programs have commented that the design of simulation programs is often premised on its entertainment rather than on its pedagogical value. Simulations are simply associated as games. Schank, Fano, Bell and Jona (1993) observe that simulations like the enormously popular SimCity feature challenging tasks for the students to perform but leave them unreflective about their activities. Schank et al. comment that "it is difficult to obtain an explanation from the program for many outcomes, and it is also nearly impossible for users to gain insight into the connection between their specific past actions and these outcomes" (p.322).

Schank et al.'s critique raises then the issue of how computer-based simulation programs should be designed in a way that it becomes a resource for knowledge building. This paper presents an approach to this design problem. More specifically, this paper addresses the following questions:

1. What pedagogical framework and learning objectives should be used to make an electronic simulation program a responsive and effective learning resource?
2. How does one design the simulation interface based on this framework?
3. What functions and features should the simulation program have to support the achievement of the learning objectives?

The Goal-based Scenario Framework

From the beginning, the program was conceptualized as an instructional resource that would make the topic of sustainable development within the context of ecotourism understandable and appealing to secondary school students and other students in the higher levels. Secondary school students comprise the primary audience of the program because the topic of sustainable development is tackled in the current high school science curriculum. A secondary audience for the program would consist of tertiary students taking up a similar topic or majoring in tourism and professionals engaged in capacity building and training for organizations working for sustainable development and sustainable tourism.

As a concept, the term "sustainable development" has various definitions and themes depending on the context of its use. One internationally-accepted definition which many educators and this program use is "development that meets the needs of the people today without compromising the ability of future generations to meet their own needs".

For students to understand an abstract concept like sustainable development, many environmental educators recommend providing students a context where they can inquire about their concepts about sustainable development and use different tools which will enable them to conduct a productive inquiry. Instead of being told what to think about sustainable development, educators emphasize the importance of having students generate by themselves an informed perspective which will help them clarify conflicting issues and determine appropriate courses for action.

The end result of such processes is behavioral change involving the practice of appropriate environmental actions. Educators say that long-term behavioral changes can only take place if attitudes and beliefs also change. Designers of constructivist programs report in their research that students are capable of achieving conceptual change in a learning environment that enables them to be dynamic producers of knowledge (Jonassen, 1992; Wilson, 1996). Various learning activities and resources in constructivist environments are designed to enable learners examine their prior knowledge and explore alternative modes of thinking. In the process, students modify their prior knowledge and construct new knowledge which rationalizes and motivates the adoption of new practice.

In order to maximize the cognitive support that simulations can provide, Schank et al. recommend based on their research designing simulations according to constructivist principles. Their design approach involves building a goal-based scenario or GBS. According to Schank et

al., a GBS is a "… a clear, concrete goal to be achieved, a set of target skills to be learned and practiced in service of this goal, and a task environment in which to work" (p. 306). A GBS program adheres to the constructivist principle of active student inquiry and knowledge production. In a GBS, the student works with a scenario which resembles as close as possible the real-world activity that requires concept formation and the performance of certain competencies.

In the "Last Resort" program, the goal-based scenarios are set on the island of Samal located in the southern Mindanao region of the country. The island was chosen because it has been identified by the Department of Tourism as a pilot ecotourist setting located near a marine conservation zone. Documents about the ecotourism development plans for the island have suggested interesting case studies for the program's use and integration.

For a GBS design to provide substantial pedagogical back-end to a computer-based simulation program, the components of GBS must determine and set the elements of the simulation's interface. In terms of pedagogy, the GBS framework requires the program designer to establish the following: the desired learning goals, the target skills, the student's mission, the scenario's cover story, the mission focus, the related operations, and the learning environment's resources and tools. The learning goals relate the general competencies that students are expected to develop. The target skills are specific actions which the students demonstrate to indicate the development of the general competencies. For the interactive program, the general goal was for the students to make business decisions which are cost-effective, protect the environment and benefit the community. The specific target skills of the students included the ability to make a profit in the operations, produce a conservation plan with minimal negative impacts on the environment and recommend community development activities.

After one states the goals and target skills, one goes on to articulate the scenario mission. Designers of GBS programs take time to conceptualize the mission because as Schank et al. (1993) put it, "it is the component that most immediately sets the tone for the student's actions" (p. 324). The mission is supported by a cover story which provides a motivating context for the accomplishment of the mission. The mission and cover story flow from the goals and target skills. For the interactive program, the mission is displayed in a message screen which the student sees when he or she enters the resort reception area. The student is told, "Your goal is to make as many positive impacts as possible on the environment and the community". In a succeeding screen, the program cover story is given as the following: "You are given a total of P50 M to rebuild a beach resort. You are given a total of 45 days to complete this task. Each day is computed as three minutes of work with the program. Every action that you take has an impact on the community, business, and the environment. There are clickable objects, videos, and other information that will guide you to make your decisions. Your actions are costly so be careful. Investigate and you will find a vast collection of information."

For the students to accomplish the mission, a mission focus is described. In the GBS framework, there are four types of mission focus which help structure the students' activities. The four types are design, discovery, control and explanation. For the interactive program, the focus of design and control were selected. For design, students are asked to rebuild an eco-resort and for control, students are challenged to manage the allocated budget of P50 M. A budget counter in the

program is given which informs the students how much money he or she has spent and the number of days left for the accomplishment of the mission.

The execution of the design and control focus requires the stipulation of scenario operations which are the hands-on activities that the students will do. These scenario operations must be congruent to the target skills and consistent with the mission and cover story. For the interactive program, students work in groups with assigned roles to do the scenario operations. There are three roles which correspond to the three sections of the program namely the Resort, the Ecosystem and the Community. For the Resort, a group member plays the role of the Business Manager. For the Ecosystem, another member becomes the Environmentalist. And for the Community, the last member acts as the Social Worker. The Business Manager in the group has to monitor the budget and earn a profit. The Environmentalist has to select building materials which blend with or have low negative impacts on the environment and recommend ways of protecting the natural environment. The Social Worker in charge of the community suggests livelihood opportunities and looks for resort work (e.g., building or repairing facilities) that provide employment to the local community.

Students also need a wide variety of learning resources and materials that will help them fulfill their individual roles. In the GBS framework, these resources should be as much as possible be authentic or identical to industry or professional practices. In the program, the student playing the role of the Business Manager has to fill out important registration forms and complete environmental impact assessment reports in order to open the business resort. The Environmentalist has a copy of the Code of Ethics for Philippine Ecotourism and access to video files of underwater marine life. Other video clips of indigenous species are also provided. All video files have accompanying explanatory text about the species. These files provide the Environmentalist with data to support his or her decisions when faced with problem situations. For the Social Worker, video resources are shown featuring community leaders discussing about Samal community needs and problems. The Social Worker can replay these clips to his or her group partners and discuss with them their concerns before they decide on specific cases.

Interface Treatment and Program Function Specifications

For the mission focus of design and control, two core program routines involving direct manipulation were established. In the first routine dealing with the process of rebuilding the resort areas and facilities, the user with the operations dashboard does the following set of actions:

1. The user drags a cursor to possible areas of building facilities in resort. Areas are hotspots which glow to signal that a particular location is a potential building site
2. User clicks on area and screen appears with three choices showing three images of different styles of building the facility (e.g., building a pool house).
3. User selects style by clicking on mouse.
4. Program responds by showing the chosen image on the building site.
5. A feedback screen appears confirming the choice and the building of the facility
6. An icon shows the running balance of the budget after the cost is applied to the budget.

7. Another feedback screen appears informing the user of the impact of his or her action on the resort, environment or community.
8. If the feedback is negative, students can go back to the sector and look for the Demolish icon. When they click on this, the facility is deleted.

To illustrate the above routine, if a group wants to build a pool house in a forested part of the pool grounds, the group clicks on a hotspot location. The program shows students three types of pool houses to build. The students click on one choice. The selected design appears on the designated area. A red light from the Ecosystem sector glows. Upon clicking on this light, a feedback message appears: Building the pool house disturbed the habitat of certain species. If the students want to undo their action, they can go back to the Resort sector and click on the Demolish icon. The program then deletes the facility. If the students ignore the feedback, they will see the action in their Recovery plan. They can discuss again whether or not they will retain the action.

These feedback screens show up every time the students make a decision. A feedback icon found on the operations dashboard blinks as a sign to the user that an impact has been created. Feedback is also given in the form of glowing red lights found on the operations dashboard which represent the areas affected by the action. If an action is done in the community, the glowing red lights for the resort and marine sanctuary area appear. A click on either light leads one to enter the area and view a message screen describing the impact in that area. Sometimes, students are encouraged to probe a particular impact they created. For example, if they are in the Community section, they can pick a particular area such as a school. They click on this and read a problem which they have to solve. They can consult a video resource about what to do prior to their selection of their decision. The decision in turn affects the management of the resort or the health of the ecosystem.

The program keeps track of all the decisions and impacts the students made. Hence, in the second routine dealing with the final outcomes, the students see a report about their group's accomplishment of the mission by doing the following:
1. The user clicks on an icon to open the Recovery Plan folder.
2. User selects a tab to see a particular section of the folder or view all the impacts under a particular category such as positive, negative and cautionary
3. When the user clicks on the plus sign, the program displays a list of all the positive impacts he or she has done.
4. When the user clicks on the minus sign, the program displays a list of all the negative impacts he or she has done.
5. When the user clicks on the exclamation point, the program displays a list of all the cautionary impacts he or she has done.
6. If the user wants to change a negative impact, user clicks on the specific action and is taken back to the program for him or her to revise. Revision is then done by clicking on the repair icon or demolish icon. The system then updates the user's list of negative impacts.
7. If the user wants to change a cautionary impact, user clicks on the specific action and is taken back to the program for him or her to revise. Revision is then done by clicking on the repair icon or demolish icon. The system then updates the user's list of cautionary impacts.

The user is given a time period to accomplish the mission. When the time is up, a message screen appears with this information. The program then calculates the final value of all the impacts and shows the group's recovery plan score. The score is compared with the score of other groups. If the score happens to be the highest among all the groups, the group's score is listed as the first and a congratulatory message screen appears. The group then sees a certificate attesting to their performance and has the option to print the certificate with their names on it.

Conclusion

The problem of producing *The Last Resort* as a pedagogically rich interactive multimedia program was addressed by integrating components of goal-based scenario with the interface design. The synthesis of pedagogy and technology helped define and shape a constructivist learning environment where students can test their prior knowledge about sustainable development and sustainable tourism and construct new knowledge about these concepts. Results from initial usability tests with several high school students and volunteer professionals have shown positive comments from the target program users regarding the program's interface design and integration of learning objectives. The succeeding task remains to first, research on and study the process of conceptual change that students experience as they work with the program and second, document the insights that they generate.

References

Jonassen, D. H. (1992). Evaluating constructivist learning. In T. M. Duffy and D. H. Jonassen (Eds.). Constructivism and the technology of instruction. New Jersey: Erlbaum.

Schank, R., Fano, A., Bell, B., & Jona, M. (1993). The design of goal-based scenarios. The Journal of the Learning Sciences *3*(4), 305-345.

Wilson, B. G. (1996). Constructivist learning environments: case studies in instructional design.. (3-8) Englewood Cliffs, N. J.: Educational Technology Publications.

_____. (1987). Our common future. World Commission on Environment and Development.

_____. (1995). Environmental impact assessment reports on Samal Island.