The Urban and Regional Planning department at the University of Florida, with support from several organizations, has developed a prototype course that uses Geographic Information Systems (GIS) to teach Albanian middle school children about environmental and sustainability subjects. The course was taught in June of 2012 at the public middle school “Dëshmorët e Lirisë” in Tirana, Albania. The course is based on online and off line data and software. The data includes both Albanian and global themes, while the software used includes the ArcGIS Online Map Services and the ArcGIS Explorer from the Environmental Systems Research Institute (ESRI), and Google Earth. The entire course and related data, as well as the products created by the students are freely available online from several websites, but its main portal is at: http://ayfeed.wordpress.com/.

Pedagogical principles that guided the design of the course included: teaching with GIS rather than about GIS, integration across many media forms, integration of concepts across disciplines, connection of student's personal experiences and practices to the larger world, a mixed grade classroom rather than an single grade classroom, balance between the role of students as consumers of knowledge versus that of producers of knowledge, classroom teaching conducted via a networked structure - with multiple teachers working as half-peers with the students and in concert with one another.

This project was conceived as a prototype case study towards the development of a broader international curriculum that would provide integrated teaching of spatial literacy and urban management subject matters to young students. Work towards such a curriculum is already underway at the University of Florida with two projects in their initial stages. One project will be developed in partnership with the College of Environment and Design at the University of Georgia in the United States, and will be taught in a local school in South West of Venezuela. The second project will be developed with the National University of Palestine, An-Najah, to be taught at the Altalaee girls’ school in Nablus, Palestine.

Keywords: GIS, Green Mapping, Sustainability, Geographic Information Systems.

1 INTRODUCTION

As part of the development of an international curriculum that would provide integrated teaching of spatial literacy and urban management issues to young students, the Urban and Regional Planning department at the University of Florida with partial funding from the Martin and Mirash Ivanaj foundation has developed a prototype course that uses Geographic Information Systems (GIS) to teach Albanian middle school children about environmental and sustainability subjects. The course, titled Albanian Youth for Environmental Education (AYFEED), was taught in June of 2012 in Tirana, the capital of Albania, to a mixed age group of students from the public middle school “Dëshmorët e Lirisë.”

Several partner organizations provided significant resources to this effort. They include the GISCorps, which provides worldwide volunteer GIS services to less advantaged communities; the Green Mapping System, which engages worldwide communities in mapping green living, nature, and cultural resources; the Mediterranean Association for the Protection of the Sea Turtles (MEDASSET), and the My Community, Our Earth, an international program of the American Geographers Association. This paper reports on the methods and the results of this effort.
2 BACKGROUND

Albania (or Shqipëria), is a Mediterranean country with a transition economy, and is a predominantly mountainous country. Its forests cover a third of its territory, and its coastline along the Adriatic and the Ionian seas makes up a third of its boundary. Although it is one of the smallest countries in Europe, Albania retains a rich biological and landscape diversity which includes a large range of unique flora and fauna. But Albania, which until the 1990’s lacked legislative mandates for environmental protection, is also an economically poor country by European standards. Ensuring the protection of its rich ecological systems, or educating its youth in this matter, has not shown to be at the top priority of its post communist governments.

On the other hand, Albania’s often violent, economically unstable, and long history of oppression has frequently kept its educational institutions from reaching their full potential, or from taking full advantage of rising ideas, practices, and technologies. While its population has had a continuing presence in the Balkan Peninsula since prehistoric times, and while Albanians speak a language as old as Latin, Albania is also a very young nation, which is still grasping with the proper shape of its educational systems and institutions. The country opened its first school in its own language in 1887, gained its independence in 1912, had a literacy rate below 10 percent in 1945 (Cook, 2001), opened its first university in 1957, and it presently has a literacy rate of 98.7 percent (UNDP, 2011) and many public and private universities.

Following the collapse of communism and the growing interaction with international organizations and their financial support, the past two decades have introduced improvements in the quality and structure of Albania’s education. However, significant strides are yet to be made in many areas, and including two critical ones: environmental science and computerized technology. Most schools in Albania, and especially schools in rural areas, have yet to provide students with access to technology, and do not include computers in the daily routines of teachers and students.

In this context, with the purpose of helping to educate Albanian children in natural resource protection and in computerized technology both at once, the University of Florida, proposed a short curriculum titled Albanian Youth for Environmental Education (AYFEED). AYFEED is an environmental educational pilot workshop that was first introduced to public middle school students in Tirana, the capital of Albania. The workshop introduced environmental and sustainability concepts in the context of Albania’s history, geography, environment and culture by simultaneously using one of the fastest growing disciplines (Batty, 2012), known as Geographic Information Systems or Geographical Information Science (GIS). GIS, a modern model of information technology framework which is increasingly becoming a main stream modus of expression, provides an attractive and visual way to monitor and analyze the environment, and a powerful geo-visual environment for communicating results to any audience via maps. While students learn the valuable skills of GIS, they are also learning the importance of interrelated systems within the environment. This in turn gives them the sense of responsibility and independence that can stimulate involved, independent thinking and hence, successful citizens.

2.1 Directive

Responding to calls from government institutions of the Republic of Albania for support and cooperation from non governmental organizations to help the country progress towards a more educated and open society, two partner organizations accepted to provide partial funding to the University of Florida for its proposal for the AYFEED project.

These partner organizations with the acronym MMIF and with a web presence at http://www.ivanaj-foundations.org are composed of the Martin and Mirash Ivanaj Foundation (a not-for-profit organization based in New York, United States), and the M.& M. Ivanaj Foundation Institute (a not-for-profit organization based in Tirana, Albania). The mission of MMIF “is to help the young generation of Albania advance their education in the preservation of freedom and independence of their country” by “promoting and encouraging culture and education” (Ivanaj, 2008).

In addition to partial funding, the MMIF also engaged in developing in-country partnerships that would facilitate the implementation of the project. They included the Albanian Ministry of Science and Education, the National Albanian American Council, the Regional Environmental Center for Central
and Eastern Europe, the Albanian Minister for Innovation, Information, and Communication Technology (also a parliamentarian), and the first United States ambassador to Albania\footnote{William Ryerson was the first U.S. ambassador to Albania after the two countries restored their diplomatic relationship in 1991, interrupted in 1946.}. The MMIF also engaged in securing and selecting the school and in supporting site related problems of infrastructure and logistics.

3 OBJECTIVES

The short term objective of this project was the development of a prototype course that uses Geographic Information Systems (GIS) to teach Albanian middle school children about environmental and sustainability subjects. The longer term objective of this project was its positioning as a prototype case study towards the development of a broader international curriculum that would provide integrated teaching of spatial literacy and urban management subject matters to young students. Another important objective of this project was the preliminary establishment of a trans-organizational, trans-national collaborative institutional partnership that would provide for a long term sustainable resource sharing and knowledge exchange framework.

Specific technological objectives were as follows:

- use freely available software and data
- use both online and off line resources
- use a combination of local and country data with regional and global data
- place all products in the public domain

Specific pedagogical objectives were as follows:

- teach with GIS rather than about GIS
- integrate across many media forms
- integrate concepts across disciplines
- connect student personal experience and practice to the larger world
- create a mixed age classroom rather than an age group cohort classroom
- keep the balance between the role of students as consumers of knowledge versus that of producers of knowledge
- create a networked rather than a hierarchical structure in the classroom - with multiple teachers working as half-peers with the students and in concert with one another

4 METHOD

The work for this project underwent through seven distinct components, and which were not conducted in a chronological order. These components include:

- exploration and definitions
- data collection
- development of the course
- deployment of the results
- teaching of the course
- partnering with cross discipline trans-national organizations and programs
- coordination and logistics planning with the project partners in Albania

The "exploration and definitions" phase was employed to review the previous work conducted in this area and to review the current education landscape in Albania. The "data collection" phase, dealt with exploring, gathering, judging and manipulating the necessary data. In the "development of the course" phase, we designed and developed the book-lessons and the related exercises of the course and thoroughly tested the accuracy of the data and the projects. During the phase of "deployment of the results" we created a website that would serve as a central hub for hosting our products and the links to its resources. We developed the book-lessons publications and their accompanying data and software, and we structured and tested the course installation and its related step by step
documentation. During the stage “teaching the course” we spent seven days in Tirana, Albania, where we engaged in preparing the lab, in teaching, and in post teaching evaluation activities. The sixth and the seventh phases, although very time and attention demanding, and although very distinct separate activities, did not fit into one explicit timeframe. They constantly and dynamically permeated the entire length of the project from start to end. But let us briefly describe each phase of the project below.

**Exploration and definitions:** In this phase, research on the most pressing contemporary environmental issues in Albania and the state of environmental education of our designated age group was conducted. The opinion of Albanian environmental scientists was also sought on the potential content of the curriculum, via informal personal and professional relationships. Extensive research was also conducted to review previous efforts conducted by the higher education community in the United States, about teaching GIS to middle or high school students. Further research was also conducted in this phase for determining the proper GIS software(s) for use in the course. As acquiring proprietary software would have increased the cost of implementation and re-implementation of the project at large, and its overall long term sustainability, we set out to design this course based on free software. Therefore our research was conducted in two avenues: we examined the adequacy of using Free and Open Source Software, and that of free, but not open shareware software. We concluded that a combination of online and offline software was a sound approach. At the end we decided to use a combination of the ArcGIS Online Map Services and the ArcGIS Explorer from the Environmental Systems Research Institute (ESRI), and of the free version of the Google Earth software, from Google Inc.

**Data collection:** In this stage, we first engaged in compiling a library of environmental and geographic databases for Albania. We set out to rely on data that was in the public domain, and we spent significant amounts of efforts in standardizing, translating, and enhancing the data that we found. We afterwards added new descriptions and information to these databases, which were tailored to our designated age group, and to our specific exercises for the course. In addition, we also engaged in compiling another library of environmental and geographic databases from the world and the region, and which also had particular significance to the topics of our course. A similar example is the itinerary of the sea turtles, a protected species worldwide with an important breeding presence in the bay of Patoku, along the Adriatic coast of Albania. In sum, the effort of finding public domain GIS data about Albania turned out to be a very onerous task, as not only very little or close to nothing existed, but also because even the little data that we found was in close to sub-standard conditions and it required much effort to be useable. Outreach efforts to public data holding agencies in the country did not yield successful results either.

**Development of the course:** In this stage, a draft GIS curriculum was first prepared for the course. Then a draft environmental curriculum was prepared. Both of these separate curricula were then merged into a new curriculum, and were then tested and re-tested for age group and cultural appropriateness. Afterwards, this new curriculum and the two corresponding geographic data libraries were integrated and structured into one single product to be used by the students and/or teachers.

The curriculum includes six stand alone book-lessons designed with step-by-step instructions and screen shots, and bundled with their corresponding data and software projects. Each of these book-lessons is approximately fifteen pages and it was paced for a young student with limited proficiency in English, working individually. An example of one exercise, of one of the lessons is shown in Fig. 1 below.

![Fig. 1: Example from Lesson 6 titled “My waste and the sea turtle.”](image)
A one day final project was designed for the fourth day of the course. In an effort to practically implement the knowledge acquired in the first three days and to encourage the students to create something new based on their own experience with their surrounding world, the course asks the students to work in teams in the fourth day and to create the first Green Map for Tirana. They are asked to create two alternatives of Tirana’s Green Map. One map showing the locations of green resources at present, the other showing future additions of green resources as proposed by the students. In the morning they are asked to discuss and to hand-draw these maps in paper using standardized icons, and in the afternoon they are asked to import and to translate the paper products into GIS via the ArcGIS explorer. The day ends with team presentations given by the students.

The curriculum also includes a course outline, a course schedule and syllabus, a reference list of resources in GIS and environmental science for this age group, course evaluation forms, an online student survey, course certificates, and other supporting documents for the course and its installation. All are freely available online.

Deployment of results: In this stage we engaged in the bundling and the distribution of the course. Our goal was to design the product for future implementation and re-implementation by anyone with minimum computer knowledge. The data, the software, the project applications, the course curriculum, and the workbooks, were assembled into one single integrated medium, which based on the circumstances could be a DVD, an online arrangement, or any other digital media distribution form. We placed all of the products in the public domain.

As shown in Fig. 2 below we also developed a website that hosts the entire course and related data and products. The project's website and its course blog are at: http://ayfeed.wordpress.com/. The entire course and related data and products created by the students are available on ESRI's web site. Lessons and data are at: http://edcommunity.esri.com/arclessons/arclessons.cfm. Student's final work is at: ESRI ArcGIS Online. The students Green Maps and the letter sent to the Mayor are published at the Green Mapping System, and at the My Community, OurEarth.

Teaching of the course: This phase included seven days. During the first two days, three teachers were in the school lab intensely preparing for the workshop. This included installation of parent and other software, installation of the course data and projects, and many other network and text book preparations and school logistics that had not quite been entirely anticipated. During the following four days the course was taught to approximately twenty students from different grades. In the fifth day, students wrote and translated the letter sent to the Mayor of Tirana asking that the municipality publish their work in its website, conducted both formal and informal evaluations of the course, and they also attended a closing ceremony organized by the school for the delivery of course certificates. The ceremony was well attended by teachers, parents, and country officials such as Albania’s Deputy Minister for the Environment, Forestry, and Waters, and the media.
The course was predominantly taught by one teacher who had intervening support from the other two teachers when their areas of expertise matched the situation. The teaching was geared towards a round circle discussion, rather than towards a classic top down model. The course was hands-on and the teachers floated the classroom providing individual help to students. The class day lasted eight hours, with six hours of teaching and learning. While we communicated constantly with the Albanian teachers and the school director during the week, we requested that they would not attend the classes. It was our view that children would be more spontaneous and would learn better if not in the presence of their teachers. Our observations of their behavior in the presence of their teachers seemed to support our views. The course was taught in English. The children did not exhibit any difficulty with English. The pace of their absorption of new concepts in GIS or technological functions surpassed by orders of magnitude our highest of expectations.

Fig. 3: The first day of class.

Partnering with cross discipline trans-national organizations and programs: In order to expand the resource boundaries of our course and to connect our effort to larger and sustainable efforts from other established organizations and programs, in this phase we were successful in establishing several fruitful partnerships, with several non-for-profit research and educational organizations that provided significant contribution and resources to our effort. These organizations include the GISCorps, which was established in 2003 and provides worldwide volunteer GIS services to less advantaged communities. GISCorps provided a volunteer teacher in Tirana (Dr. Jennifer Rachel from the United States Department of Agriculture in California). The Green Mapping System, which was established in the mid-1990s and which engages worldwide communities in mapping green living, nature, and cultural resources, provided us not only with ideas, its web resources and cartographic methods and standardized icons, but it also prepared a special video for our students, and delivered Green Mapping certificates to them. After the course, they also published the children’s work products in their website. The Mediterranean Association for the Protection of the Sea Turtles (MEDASSET), which was established more than two decades ago, also provided us with a special video narrative about the protection of the sea turtles, with brochures and educational materials that they translated expressly for us into Albanian, and with other web resources and data that they made available to us. The My Community, Our Earth, an international program of the American Geographers Association, published the children’s work products on their website, supported them with additional special certificates, and also offered their political support to us.

Coordination and logistics planning with the project partners in Albania: It is close to impossible to describe the numerous details and infinite strategies that we needed to employ and which not infrequently had to change direction drastically over-night, or that repeatedly tested our patience, indulgence, and determination with cross-continental institutional communications, understandings, and misunderstandings with formal and informal commitments and expectations. But it is important
however, and highly significant to highlight, that more than fifty percent of our effort in this project was conducted in this phase, which very modest and simple goal was to reach the children and to teach the course on site.

5 RESULTS AND DISCUSSION

Cognizant that results for projects of this nature can be defined and reported in many ways, we will limit our reporting in this paper to the final products created by the children and to the evaluations that they provided for the course.

![Fig. 4: Example of hand drawn green map.](image)

![Fig. 5: Hand made and electronic green maps side by side.](image)

In our view, this prototype course was a big success among students, parents and school officials. It was clear to us, since day one, and especially after observing the web traffic after the first day of class, that these children were genuinely interested and highly attracted to this course. During the closing ceremony of the course, parents told us stories of them talking non-stop at home about what they had learned during the day, and they inquired about other similar future opportunities. We started this project from a distance and engaged in it with many unknown variables, but during its teaching week from the beginning till the end, the children repeatedly exceeded our expectations.

Below are the results from two forms of qualitative evaluations that we conducted. We conducted a structured and anonymous questionnaire at the end of the course, and a free writing anonymous evaluation at mid-point of the course. The questionnaire asked six questions. To the first three questions: “Did you enjoy this course?” and “Would you take another similar course in the future?” and “Do you think that you learned interesting subjects during these three days?” the answers were hundred percent “Yes.” To the fourth question: “From which of the subjects did you learn the most (Environment, GIS, English or all three)?” twenty five percent answered GIS, while seventy five percent answered “all three.” The other two questions sought their opinion about the most difficult or easier parts of the course. Eighty percent of the answers to these two questions emphasized how easy and charming the entire course was.
But the students’ free writing evaluation captures in a much more meaningful way their attitude towards the course. We asked them to write anything negative or positive about their experiences. Some answered with just a few sentences, one or two answered with full page length thoughts, and the majority wrote an average of half a page. Below we include the transcript of one evaluation which best describes the atmosphere that we experienced.

*I like this course very much! Why so? Because except the fact that I’m not stayin’ home all day, I had fun, I met new people, I improved my English, I learned about something I never heard about. Also I’m learning so much beautiful things & news about animals and how can we help them. For me this course was the most beautiful thing that happened in this summer so far! Thank you!*

Fig. 6 below shows a collage of some of these free writing evaluations.

In the development and in the teaching of this course we have strived to provide education with a focus on conceptual understanding rather than just GIS computer training. We have also strived to stress connections and integration of concepts across disciplines and with the experiences of daily life. We deemed it important to also create some room in the curriculum (perhaps at the expense of introducing a few more new concepts) for authentic creativity and for political empowerment and self expression of the students. Our goal was to stay clear from embracing technology for its own sake, and to approach the introduction of a new technology more as a means for improving and for humanizing conceptual understandings of the surrounding world.

This project was conceived as a prototype case study towards the development of a broader international curriculum that would provide integrated teaching of spatial literacy and urban management subject matters to young students. Work towards such a curriculum is already underway at the University of Florida with two projects in their initial stages. One project will be developed in partnership with the College of Environment and Design at the University of Georgia in the United States, and will be taught in a local school in South West of Venezuela. The second project will be developed with the National University of Palestine, An-Najah, to be taught at the Altalaee girls’ school in Nablus, Palestine. And in Albania, it is our wish that the next step for this project should be its implementation in many other schools across the country.
REFERENCES


