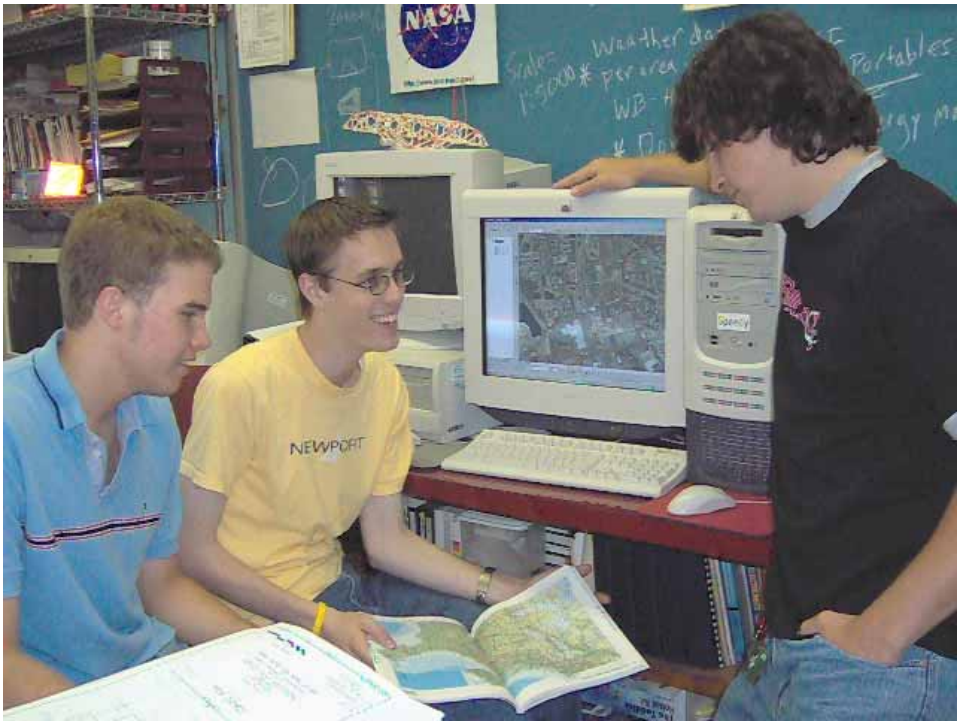
Title - VDOE and TSA Partner to Develop a Geospatial Technology Contest



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Abstract - VDOE's Technology Education Service has developed a statewide pilot program in Geospatial Technology. The problem - defining geospatial technologies for a widely distributed and diverse audience. Recognizing the need to get students meaningfully involved with the technology, a core group of Virginia technology educators developed a competitive event for Technosphere, Virginia's Technology Student Association statewide conference.

Students need to understand the technologies and their application to real-world problems. We also want to motivate students to pursue an education that will prepare them for knowledge-based jobs in our increasingly information-driven economy. Therefore we developed a competitive event that requires students to solve community problems with real data including aerial photography, shape files and GPS waypoints

which will be collected live on-site. Students are required to build a portfolio of data prior to the contest for presentation, then to arrive with the hardware and software to solve a related live problem on-site.

Body - Across Virginia twelve schools in ten school divisions are piloting the Geospatial Technology Program curriculum. There are two methods of participation. Some schools are teaching the full course, while others are integrating selected course competencies into their existing curricula. There is also an effort underway to offer an online version of the course to maximize the availability of this dynamic and exciting curriculum to students across the state.

Beginning a new program that is unlike most technical courses being taught in the state creates some immediate challenges - one of which is the need to communicate with a diverse set of school populations. We need students to develop interest in and awareness of what geospatial technology is all about. This need was addressed in a series of meetings and events that were held around Virginia in support of the Geospatial Technology Program.

In the spring of 2004 during the Virginia Department of Education's Geospatial Technology curriculum development workshop, George Willcox VDOE State Specialist for the Technology Education Service, challenged a group of interested parties at dinner to think of ways to draw students into this new program. He then suggested that a contest at "Technosphere" - Virginia's Technology Student Association State Leadership Conference - would be an ideal way to promote the new curriculum. A group of teachers, professors and industry professionals began to discuss ideas that might lead to a successful competitive event. We settled on a design brief format and began to

brainstorm themes that might be motivational for the students who would participate. We then began to cover the technical requirements that such a contest might require, specifying exactly what experiences would benefit the students' knowledge base and mirror the requirements of industry.

This conversation led to a late night of writing to capture all of the ideas that floated around our dinner conversation. There was so much energy during our meeting that it had to be retained and recorded immediately. At our final curriculum committee meeting the next day, a draft set of pre-conference and on-site design briefs was presented to the full Geospatial Technology Curriculum Committee. These design briefs would eventually drive our new competitive event. The group agreed to correspond via e-mail, continuing to work on ideas and editing the set of design briefs and requirements that would eventually make up our contest rules.

Two design briefs, problem-based learning activities developed using a constructivist theoretical approach to learning, were constructed to represent what students would do in competition. The "pre-conference" design brief, which is actually turned in at the beginning of the event, asks student teams to imagine that they are "new hires" in the GIS department for the city of Hampton, Virginia. Their first job assignment is to create a base-map of the city that would be the basis for many other projects that would be conducted in the city's future. The focus of this activity is acquisition and presentation of data sources with the necessary metadata and preparation of a data bibliography citing each source. This gives the student the opportunity to interact with a wide range of data types (DOQQs, DRGs, shape files of many themes, and remote sensing data). Students can become familiar with the geography of the general

area where the on-site competition will take place and also spend some time brainstorming what might be accomplished using the variety of data that is available. The second design brief presents the student with a scenario: The President of the United States is coming to visit the Hampton Virginia Holiday Inn. This just happens to be the location of the state Technosphere Leadership Conference. As a team, the students must formulate a plan that will be provided to the Secret Service that describes the building and grounds for security purposes and suggests a location for a gallery where the President will meet and/or wave to the public. This design brief serves as an example of the type of problem that may be encountered at competition. The judges will provide data for this competition to the students on CD – thereby putting everyone on a level playing field. Some themes will be collected live on-site via GPS by the student teams and imported onto the students' maps for display.

During the VTEA summer conference, the rules for the contest were developed. Technology Student Association contests have very specific rules and procedures that are developed to ensure fairness and adequate notification for students who prepare entries for our competitions. This contest was modeled on another event that has pre-conference and on-site competitive components. A core group of instructors and assistants who were at the conference to teach a graduate course on Geospatial Technology offered by James Madison University agreed to edit the final set of published design briefs and the contest rules. This allowed for timely publication of the contest rules in the Virginia Addendum to the National TSA rules that is distributed to TSA advisors across the state.

Advisors across the state then began to have their students prepare entries for the Geospatial Technology competitive event. Eventually five teams were registered to

compete in the event for the first time in the spring of 2005. To prepare for the pre-conference event, a base map of Hampton, Virginia was prepared complete with data, metadata and a data dictionary. Professionals from industry and government were contacted by the student teams to provide data where none was available online. Only free data sources available via the Internet, telephone or data that ships with ESRI's ArcGIS package were allowed for use in competition. Students struggled to find data accompanied by sufficient metadata, which is an experience common to industry professionals. In the pre-conference event, these data sources were documented as they were collected and assembled into impressive base maps for the city of Hampton, Virginia.

Across the state, advisors were developing design briefs to help students gain a better understanding of their surroundings using GIS, GPS and Remote Sensing. While each of the following examples vary in their instructional objectives – all have a common thread: making students understand how "place" is associated with our lives in almost every way. These examples are a small sample of the innovative curriculum content that is being developed by Technology Educators across the state of Virginia.

Trek Home – Ron Vickers – Rappahannock County High School

Photo courtesy of Ron Vickers

Students construct maps in ArcView that feature the route from their home to school, complete with a legend and compass rose. GPS waypoints are collected on the daily journey home to mark the route. Pictures of the students' home and school are taken and placed on the map at each end of the trip. The waypoints collected by the student are imported onto the map to show the "Trek Home." Students also use ArcView's tools to determine the mileage as "the crow flies" as well as the mileage via the roads traveled. Students prepare "turn by turn" directions to document the trip. In some cases elevation is also displayed.

Where Am I? - Tom Spencer – The Chesapeake Center for Science and Technology

Students learn to use a GPS receiver by participating in geocaching and data collection activities. Waypoints are taken where items are hidden for students to find as they navigate around the school grounds using the points preloaded into the GPS receiver. The accuracy limits of the device are dynamically demonstrated when students find themselves "where" they should be (via the waypoints recorded in the GPS), then short rhymed clues are used to help the students problem-solve to find the hidden objects described in the short poem. Students connect to the ideas of longitude and latitude while actively moving around to find their destination. Once they reach their destination they will note the distance from their point found on the GPS to the actual location of the cached object. Following this activity – students separate into two groups. One group maps the campus boundaries while the other group records the physical location of the building on the grounds. All themes, geocache, school building and

property boundaries are imported into ArcView on top of a DOQQ of the campus location. Students then use the view manipulation and measurement tools to discuss the accuracy of the data collected. Finally GIS professionals from local industry visit to discuss how they use geospatial technologies in their work. The students leave with an understanding of where they are and how data is generated to locate many different things that we depend on every day.

Home Is Where the Heart Is – Chris Kelly – Thomas Dale High School

Students take on the role of a real estate land assessor. A young couple, newly married with two children, one infant and one four year old, have entered the office and inquired regarding their interest in moving to Chesterfield County. Their salaries combined, enable them to purchase a home for no more than $135,000 in a respectable neighborhood, free of crime, with good schools. Students are to locate, using any resource at their disposal, two properties that best fulfill the couple's needs. They then print two maps identifying the locations, and key features. Describe the locations, and defend the choices selected to present to the clients. The maps can be in the form of real estate brochures, if desired.

These deign briefs represent a best practice project-based learning approach to curriculum that is both challenging and motivational. Students become engaged in solving the presented problems and produce products that represent their depth of understanding of the subject matter. Students feel that they are in control of their learning and are more likely to invest themselves in the process. Cooperative learning is also emphasized in recognition of the team-oriented environment that exists in the

modern workplace especially among knowledge workers such as GIS professionals. These design briefs are most often constructed with a community–based approach that informs the student about her / his surroundings and their relationship to the larger community, eventually establishing a geographic awareness that many modern students seem to lack. Projects based in the community help students to connect to others and begin to feel as if they are part of something larger than themselves.

In writing rules for the contest, emphasis was placed on clear communication about the expectations for each required element while allowing teams to express their ideas creatively. Most rules were generated with the intention of allowing students from differing geographic areas with varied access to resources to remain competitive. This also generates an opportunity for students to interact with practitioners in the professional community, advancing their development and expanding their network of contacts. The on-site competition emphasizes the ability to work as a member of a team while under severe time constraints, another "real–world" skill that is valued in industry.

Administration of the on–site event required the event coordinator to communicate limitations directly to teams and their advisors. Team members cannot remain sequestered, due to the need to collect data around the site with the GPS. Therefore, all team members had to be warned not to communicate with their advisors until the event was complete. The event coordinator also had to move about the contest site to enforce this rule. Conducting a short interview with team members prior to their departure in which they were allowed to explain their contest submission proved to be very valuable. It was also noted that the statement of the exact format required for

submission of the pre-conference event materials needed to be clarified. Some teams presented data on CD only, without a hard-copy binder displaying the data as intended.

During the first administration of the event, Mr. Willcox from the Virginia Department of Education coordinated and judged the competition. In the future, we plan to involve professionals from industry in the administration of the contest. Their involvement will serve to make the evaluation process mirror the standards that are used in industry as well as to further extend the networking opportunities for students who participate in this dynamic contest.

We have found that the Geospatial Technology Competition has energized students and instructors across Virginia. During the awards ceremony at Technosphere 2005 students and advisors alike could be heard asking questions like the following: "What's that competition all about?" "What do you need to be able to compete in that contest?" Statements such as "We're going to try that next year guys!" could also be heard. The contest is meeting its design criteria: to allow diverse groups of students and teachers across Virginia to know what geospatial technology is, to generate interest in the program, and to motivate the community of learners to get involved.

Acknowledgments –

Many thanks to Kathryn Keranen, Joanne Rowe and Mark Saunders for editing the Geospatial Technology Contest rules. Thanks to Ron Vickers and Christopher Kelly for sharing their experiences with students and the associated design briefs.

Appendixes

1. Technology Student Association Geospatial Technology Contest Rules
2. Pre-conference Design Brief – Base Map of Hampton, VA

3. On-site Design Brief – A Presidential Visit to the Hampton, VA Holiday Inn

References

1. Technology Student Association Geospatial Technology Contest Rules and associated design briefs published in the Virginia Addendum to the Technology Student Association 2005-2006 Competitive Events Activities.

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The Virginia Geospatial Newsletter, Volume 2 Number 4, Fall 2004

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