Learning and Law Enforcement: How Community-Based Teaching Facilitates Improved Information Systems

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Abstract
To keep pace with the dynamic environment of information systems, it’s necessary to prepare the next generation of the workforce for entry into this atmosphere. Department of Homeland Security Center of Excellence: VACCINE has partnered with the INGang Network, a component of the Indiana Intelligence Fusion Center to facilitate the best preparation for students and assist with some information system issues in the law enforcement industry. Exposing students to real-world applications not only facilitates the problem-solving process with respect to information systems, it also makes the student aware of the prevalent system issues. By participating in community-based teaching with law enforcement officers, the students gain a better understanding of the end user which allows them to design better information systems. There is an initial learning curve associated with integrating in any community, having a close working relationship with INGang has lowered the barrier to entry, ultimately allowing for a better information system to be created.

1. Introduction

Established in July of 2009, the Visual Analytics for Command, Control, and Interoperability Environments Center (VACCINE), along with its co-lead, Rutgers University, has served as the Department of Homeland Security’s (DHS) Center of Excellence in Command, Control and Interoperability. VACCINE’s mission focuses on creating methods and tools to analyze and manage vast amounts of information for all mission areas of homeland security, including our first responders and law enforcement officials. VACCINE accomplishes its mission through an integrated program of research, education and outreach, spanning the disciplines of visualization and computer graphics, engineering, computer science, geographic information systems, cognitive psychology, information technology, and emergency management and public safety. In pursuit of the center mission, VACCINE has partnered with over 40 first responder and law enforcement entities in order to ensure that our software tools enhance their ability to obtain, process, and gain insight from information. This problem driven research approach not only ensures real-world solutions and enhances transition to practices, but also provides greater research challenges. Our approach also greatly enhances the educational experience of our students; in initiating these partnerships, the graduate students of VACCINE are provided the opportunity to witness first-hand, the struggles with information systems currently in place for first responders and law enforcement officers. While VACCINE has numerous partners engaged in this problem-driven research, the Indiana Fusion Center and Indiana Gang Intelligence Network (INGang Network) have worked closely with our students to explain the struggles associated with information sharing and solution development.

VACCINE focuses on the research, development, and deployment of interactive visual analytic environments for communicating and disseminating information and deriving insight from the massive data deluge. Visual analytics is defined as the science of analytical reasoning facilitated by interactive visual interfaces[1]. Part of the mission of the center is to help decision makers make sense of the sea of text, sensor, audio, and video data by developing powerful analytical tools and interactive visual decision making environments that enable quick, effective decisions as well as effective action and response based on available resources. VACCINE integrates data and analysis into interactive visual displays to enable users to make discoveries, decisions, and plan action; in the project with the INGang network, that interactive visualization and analysis tool took shape in the form of GARI.

2. Background

While community-based teaching is nothing new, the concept is being applied to novel fields and disciplines such as software engineering and design[2]. Historically, community-based teaching
has most often been seen in the medical field. In 1993, *Tomorrow’s Doctors* recommended an increase in community based teaching for undergraduates entering the medical profession[3]. This endorsement is correlated to a change in the methodology of preparing students for an occupation in the medical field, and is now common practice.

In applying this same approach to software engineering and system design, similarly to medical students, the individuals learn how to cope with patients or in this case, end users. Students routinely report they enjoy the community based teaching and feel they are better prepared for the workforce. In providing the experience of an internship without the time constraints, students can continue progress towards their degree, while gaining the real-world experience so many corporations and entities value – and for good cause. The practical application the students experience during this community based teaching requires that they increase their communication, leadership, and interpersonal relationship skills. In the field of software engineering or computer science, this can mean the difference when competing for a sought after position. Many universities require a speech or communications course in the engineering and computer science fields in an attempt to secure this skill among graduates whose stereotype is reserved and more comfortable communicating through machines. There is virtue in the ability to explain technical jargon in a language that individuals with a non-technical background can understand. Being able to speak technically and explain difficult concepts on a general level is a coveted skill. In participating in community based learning with the INGang network, these students have built their skill set to be better communicators, leaders, and ultimately, better system designers.

VACCINE has developed a strong partnership with the Indiana State Police, the Indiana Fusion Center, and in particular with the INGang Network. The INGang Network, which is run through the state fusion center, was developed in order to have a cohesive network to share information regarding gangs and gang activity among law enforcement officers. The creation of INGang is a perfect example of the issues that law enforcement officers encounter with respect to information systems and why it is critical to train the future system designers well through community based instruction.

Knowledge and information transfer among law enforcement officers is not facilitated by the current databases and information systems available. As such, the Indiana Fusion Center and State Police created a network of individuals dedicated to sharing gang related information. The creation of INGang is for the sole propose of transferring and propagating information. This is a prevailing theme across law enforcement agencies. There is no standardized database or record management system; each department or entity has selected their own, some have even custom designed systems to meet their individual needs. VACCINE graduate students have the opportunity to work with the law enforcement officials to assist them with their information systems and in particular, extracting information from them in a useful, productive manner.

3. Related Work

The concept of community-based teaching is common in a number of disciplines such as education or medical professions — for good cause. It is a common belief that there is no better training than experience. It is, however, not unheard of in other science disciplines. Purdue University’s College of Engineering has created a program called EPICS – Engineering Projects in Community Service. The idea of EPICS is to provide students an opportunity to see how their work can impact the community, and teach them something along the way[4]. The projects can be quite long term (up to 3.5 years in some cases), and are almost always multidisciplinary in nature. The program went national in 1997 in order to reach a wider range of students. In this pursuit, Butler University attempted to adapt the current structure of the program in 2001 to apply to Computer Science, specifically for the field of Software Engineering (a group of students who are likely to develop information systems in the future)[5]. Butler was in the process of creating a software engineering degree and they wanted the students to have the opportunity to act with real customers on a deeper level than an internship would provide. They also wanted this relationship to be a longer-term time commitment than internships traditionally last. In this manner, the students could experience what a career in software development would mean.

After completing the first year of this program at Butler, the students were surveyed as a method of determining the effectiveness of community-based teaching. As expected, they found the majority of the students valued the experience – 92% even found that the EPICS program had a substantial impact on their customer awareness[5]. This is significant in the field of information systems. In order to design a productive, successful information system, understanding the end user or customer base is a critical step. If students feel that community-based teaching makes them more aware of the end user, that is one step closer to developing a better information system.
The original EPICS program at Purdue University also surveys its students regularly. In 2012 a survey was distributed to every alumnus that had a registered address in the school’s database. Of the 2500 or so solicitations to participate, 528 surveys were completed. The alumni who participated varied in their majors and number of semesters involved in the EPICS program. From the survey, more than 70% of the alumni felt that the EPICS program had “some, large, or very large” impact on that individuals performance as an employee once they entered their professional field. Additionally, 20% claimed that EPICS actually influenced their selection of a career and went on to explain how[4].

4. GARI

The INGang Network and VACCINE have entered a two year pilot program in order to collaboratively develop tools designed to facilitate the transfer of information among the INGang Network. Our initial tool in its testing phase is the Gang Graffiti Automatic Recognition tool, or GARI[6]. This application was designed to catalog and categorize gang graffiti images. Gangs and gang violence are a major issue across the country. With some 33,000 violent gangs encompassing 1.4 million members, the ability to convey information among law enforcement officials is a necessity[7]. Gang graffiti has unique symbols, colors, and methodology to indicate threats, meetings, or other messages. By creating a tool which can essentially be used as a repository for information to decode gang graffiti, VACCINE students and law enforcement officers have created a new information system to facilitate this transfer of knowledge. VACCINE students were integral to designing the system. In working closely with INGang, the students were able to experience for themselves the struggles and frustrations of the current information systems and better understand the issues facing end users.

After learning of the issues with sharing and categorizing information related to gang activity, the students could see that the current information system would not suffice to provide the appropriate information and, moreover, would not allow for that information to be easily shared among law enforcement officials. GARI allows for the capture of graffiti images on Android and iPhones (expected late summer 2013). The application then uploads the images to the GARI server that, if so requested, will run an algorithm to test the image against other known images in the system in order to find similar images. Each image can be tagged with various levels of information – the meaning of a symbol, the associated gang, officer comments or notes, etc. The tool will then allow any other member of INGang who has installed the software to view the images and annotation. There is a map tool for looking at the geographic distribution and placement of graffiti – the software will even use the GPS location of the phone to display the graffiti images within a selected radius.

Figure 1: GARI app main screen

5. Student Experience

In order to look at the future of information systems, it’s critical to look at the individuals who will be developing those systems. VACCINE students have a unique experience in their education as they are expected to produce a deliverable and deal with an end user/customer, in this case the INGang Network. These very same students will recall the frustration and issues they encountered and overcame when examining the different record management systems from county to county, or attempting to install a program designed to tunnel to a server on a secure network. These experiences have made them aware of the common and prevalent issues that propagate throughout information systems that are critical to safety.

6. Conclusion

Based on the experience in interacting with the INGang network in combination with research related
to community-based teaching, the approach appears to be an excellent method of preparing students for issues they will encounter and could avoid by appropriately designing information systems. As information systems can determine so many facets of productivity in the workforce, it behooves educators charged with preparing the next generation of professionals, to find the best method of educating and training students to develop and design these systems. The VACCINE partnership with the INGang Network arose from the need for information sharing outside of the existing systems, as they were not well designed. By allowing the students to facilitate a new system, the INGang network has also trained a better information system expert. This initial step is the start of the a Midwest partnership that will explore challenges at agencies of various sizes and structures in order to ensure the students are well-rounded in their exposure to the information systems available in the law enforcement arena while exposing them to any number of issues from a lack of network to severely limited bandwidth. With this increased exposure and practical experience, the students are well prepared for a globally competitive, highly distributed workforce.

7. Acknowledgements

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8. References


