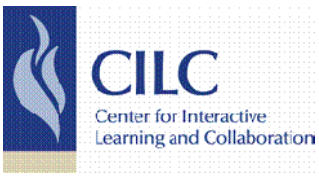

ROCKMAN *ET AL*
Bringing Technology and Learning Together

Reflective Engagement of Students and Educators in Community Decision-Making via Problem-Based Learning

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ABSTRACT

This paper will focus on the research results, lessons learned, and obstacles overcome during implementation of the Center for Interactive Learning and Collaboration's (CILC) *Vista* project, an educational initiative founded in 1998 in Indiana, USA. CILC *Vista* provides a framework to support collaborative studies of authentic community issues. Guided by the principles of problem-based learning, students and educators collaborate with local stakeholders to identify a significant community issue, then apply academic rigor to define and investigate a "driving question" and explore solutions. These studies encourage elementary, middle, and high school youth to rally round community issues and work together towards solutions. *Vista* partnerships utilize multiple forms of technology to connect educators, students, and community members as they design and implement an action plan and make recommendations for change.

This paper will share the results of six years of research on the CILC *Vista* program, conducted in partnership with the research firm of ROCKMAN *ET AL*. The research, which includes both quantitative and qualitative data, explores students' engagement in community issues, classroom use of problem-based learning, and the use of technology to support collaboration. The

research also looks at the partnerships that are crucial to the successful implementation of a problem-based focus and at the broader educational impact of the program.

Reflecting on the power of technology to connect a cadre of learners committed to finding solutions to societal issues that are both creative and viable, the paper will also explore prospects for fostering international collaboration through the expansion of the program to the global community.

MAJOR POINTS

- **Collaboration**

  Collaborative Dialogue among students from varied backgrounds – Critical Friends

  Collaborative efforts and partnerships with their community/local Business leaders.

  Collaborative Partnerships designed to support the Initiative

- **Problem Based Learning**

  Impact and design – project results for students, educators and community

  Critical Partners in reflective decision making

  Promoting Critical thinking

- **Role of Technology**

  Tool for Research

  Communication link

  Presentation opportunities

  21st Century Learning Skills

Category – Building Collaboration while Unleashing Creativity

Overview of CILC and the *Vistas* Program

The *Vista* project, which began in 1998, is an educational initiative of the Center for Interactive Learning and Collaboration (CILC). CILC's parent organization, the Center for Educational Communications (CEC), grew out of a desire to use innovative telecommunications technologies to connect schools around the state of Indiana. CEC oversaw the development of Vision Athena, a project that linked teachers and students to the rich resources provided by state and national institutions that included higher education, arts and cultural institutions, hospitals and health organizations, and libraries. The *Vista* project, now in its sixth year, furthered that goal, fostering partnerships between schools and the larger community designed to engage students in real problems, develop technology and information literacy skills, tap rich community resources, and add a problem-solving dimension to traditional content area instruction.

The *Vista* program began with a partnership between Indianapolis, Indiana's Metropolitan Planning Organization (MPO) and nearby middle and high schools. In the first collaborative venture, students looked for solutions to traffic congestion and explored alternative transportation options; in the second, they studied city bicycle and pedestrian trails. The level of students' participation, the quality of their research, the depth and range insights they presented—all impressed teachers and community partners, and led CILC to arrange and facilitate to a number of successive collaborations devoted to studying diverse community problems: the highly controversial expansion of an interstate highway, the restoration of a historic building and its conversion to a community center, toxic waste in local streams. Over the years, community partners have included city officials, architects, community planners, business professionals, healthcare experts, and neighborhood representatives, all of whom have supported students' investigations, listened to their reports and presentations, and seriously considered their solutions (see http://www.cilc.org/community_partnerships.aspx).

Built around the pedagogy of problem-based learning, the *Vista* model promotes learner-centered classrooms, higher-order thinking, and student investigations of complex problems.[i] Collaboration is built into the process from the very beginning and informs the investigation throughout: students and teachers—

within and across schools—work with businesses, city officials, and other local stakeholders to identify a significant community issue. Investigations begin with discussions of a "driving question," broad and compelling enough to keep students engaged and inspire wide-ranging explorations, but narrow enough to focus their energies and structure their studies. Through an iterative, collaborative process, students work with teachers and community partners to explore problems from different angles. They gather, analyze, synthesize, and evaluate information from a variety of sources, and ultimately propose solutions. Multiple forms of technology—computers and productivity and presentation software, interactive video, and email—connect educators, students, and community members and support their work.

This paper will describe in more detail the:

- framework and design for the CILC *Vista*s
- implementation process and support structure necessary to support a Community Problem Based educational engagement
- research on the *Vista*s and their impact on students, educators, and community members
- viability of this type of educational endeavor for other communities
- ideas for connecting students globally in collaboration around community issues

The *Vistas* Model and Its Impact on Teaching and Learning

The three main components of the *Vista*s model are collaboration, problem-based learning, and connectivity, provided by technology. CILC initiates and facilitates the partnerships, but classroom teachers and their students set the course and destination of each *Vista*. As the partnerships and problem explorations move forward, CILC facilitates videoconferences and provides resources and on-site support as needed. Teachers also receive professional development to help them guide students through authentic problem-based learning experiences and take advantage of interactive video technology.

Further describing the three components of the *Vista*s model, the following discussion also includes findings from research conducted to explore the *Vista*s' impact, conducted by ROCKMAN *ET AL*, an

independent research and consulting firm that studies the impact of technology on teaching and learning.[1] In addition to serving as evaluator for numerous local, state, and national schools efforts that focus on changes in classroom practice, innovative uses of technology, and partnerships that break down the walls between schools and the world outside, ROCKMAN also conducted the evaluation of the original Vision Athena project. For the last six years the company has studied the growth and development of the CILC *Vista* program and collected data on a series of outcomes that include:

- Students' problem-solving skills
- Changes in teachers' pedagogical beliefs and practices
- Students' awareness of community issues
- Students' critical thinking skills
- Students' attitudes towards their academic classes and their local communities
- Students' and teachers' use of technologies, including video-conferencing
- Integration and achievement of standards

COLLABORATION AND COMMUNITY PARTNERSHIPS

CILC *Vista*s, vital community partnerships create in-depth collaborations between students, schools, public and government entities, and community organizations. Students collaborate with city officials, architects/community planners, business professionals, healthcare experts, and neighborhood representatives who support and teach students on topics enhancing their investigation of vital community issues. All CILC *Vista*s allow educators to work within a defined framework using instructional methodologies that complement current classroom practices. *Vista* collaborations incorporate multiple technologies. In addition to extensive use of videoconferencing, they employ Web-based communication and advanced use of technology investigation and presentation tools. Videoconferencing tools allow students to create dialogue among themselves and across the community, strengthening their critical analysis of their *Vista* issue.

FRAMEWORK COMPONENTS/INSTRUCTIONAL METHODOLOGIES

• Study of an authentic community issue

• Research component

• Mix of urban, rural and suburban communities

• Address academic standards

• Interdisciplinary approach

• Problem-based learning

• Student solutions that are incorporated and/or implemented into local community proposals

• Collaborative partner support

• Community awareness component

• Celebration opportunities to professionally share solutions

• Application of appropriate technology aligned to NET Standards

HOW CILC VISTAS ARE IMPLEMENTED

The CILC *Vistas* are typically implemented in one of two ways. The CILC identifies a pressing community issue, brings together interested parties, and coordinates project parameters. Or, CILC works with a school interested in creating educational community collaborations to identify a local issue and the list of businesses and community entities willing to participate.

The various participants then communicate via two-way, interactive, videoconferencing equipment and the Internet to conduct research, design solutions, critique recommendations, and present reports. This real-time interaction allows for cost-effective, timely communication.

In the end, using a variety of technological applications ranging from PowerPoint to Imovies, the team delivers workable solutions that have true bearing on an authentic community issue.

Category – Building Collaboration while Unleashing Creativity

Research shows that the *Vista*s:

Cultivate students' sense of community. Data from a national survey in civic awareness and responsibility[ii], administered during a 2003-2004 study, indicated that students participating in the *Vista*s have a stronger sense of community interest than non-*Vista* students, who indicate greater interest in self. *Vista* students express a stronger inclination to be involved in their communities and a more collaborative vision of what community is. The scaled responses of participating middle school students were significantly different from those of non-participating students for 85% of items measuring self vs. community interest.

Change students' attitudes about community service. The same survey results showed that *Vista* students are more altruistic in their attitudes toward others and their participation in projects for the school and community. They are motivated to get involved in school or community projects less because they want teachers or friends to think well of them than by grades and their sense that such activities are enjoyable. Both high school and middle school *Vista* students are more motivated than non-*Vista* students from comparable schools and classes to contribute to community projects because they think it is good to help others.

Vista participation encourages students to be more active citizens. Over half (53.5%) of all high school students participating in *Vista*s are more likely to consult people (rather than just the Internet or print resources) in the research process after their *Vista* experience. Almost half of the *Vista* students (49.3%) are more likely to volunteer or participate more in their communities due to the *Vista*, and about 45% of students say they are more likely to attend public meetings about an issue they are concerned about or follow it in the media.

Over half the students (53%) who made presentations at 2003-2004 Celebration Dinners, the culminating events of *Vista*s collaborations, felt that their work had benefited the community "very much." The remainder felt that their work had had at least somewhat of an impact on their community. That sense of

accomplishment was echoed in students' comments about what they learned during the *Vista* process that would be helpful to them in the future: students referred to things they had learned about their communities, or voiced their commitment to remain involved in their communities in the future.

Vistas help students develop more effective communication skills. Student and teacher data collected over the project's history show that, during *Vista*s, students communicate and collaborate more frequently than usual—and they do so with more diverse audiences and for more authentic purposes. *Vista* students are also more skilled and persuasive writers, who use a variety of organizational and prewriting strategies, thereby meeting more advanced persuasive writing standards than their peers. Teachers consistently report that students' communication and collaboration skills improve considerably due to the *Vista*: In 2001, for example, teachers rated students' gains in communication skills at 2.9 on a 3-point scale, (1= not at all, 3=greatly); in 2000, teacher pre/post data showed an increase from "less than satisfactory" to "good." Gains were due in part to the fact that *Vista*s gave students more opportunities to use technology—videoconferencing, email, presentation software, web pages—to communicate with others.

PROBLEM-BASED LEARNING

CILC *Vistas* provides powerful examples of the strong, pedagogically-sound instructional strategies and classroom practices that, according to current educational research, characterize effective teaching and learning. In recent decades, educators have increasingly been urged to adopt approaches that shift the classroom focus from teacher to student and invite students to take an active role in their learning (Means, 1995; Reigeluth, 1999). Among these approaches, problem-based learning has been advocated for its effectiveness in engaging students in issues that mean something to them, while at the same time helping students develop critical thinking skills and acquire standards-based concepts and skills.

Problem-based learning begins with a problem that is complex, not easily solved, what educational theorist call "ill-structured."[iii] To understand such problems and propose viable solutions, students have to dig deeper, seeking information from a variety of sources, analyzing it, combining and recombining facts,

considering and reconsidering solutions, most often and most profitably with the help of peers and outside partners. During an authentic problem solving process, students are able to develop their own approaches and set their own goals. Under the guidance and coaching of a skillful teacher, students work collaboratively to inquire, investigate, and plan their activities (Sage, 2000).

As students tackle, explore and investigate their *Vista* partnership issues, they are encouraged to work from a "Driving Question" which in turn generates their investigatory research. Educators and students utilize their complex problem to "drive" their explorations, interviews, and data gathering efforts. Investigations allow students to dig deeper and unravel the complex issue and its many facets. As students become engaged in their in depth analysis of data gathered from investigatory research, they partner with other students and their appropriate community constituents to reflect upon possible solutions. The CILC *Vista* program encourages students and educators a like to build instructional practices in their classroom to support the skills necessary to create these intensive studies.

Research indicates that teachers in *Vista* classrooms:

Use more student-centered learning strategies. In numerous post-project surveys, reflections, interviews, and focus groups, teachers have attested to changes in their classrooms—students have taken more responsibility for their learning, and teachers themselves have assumed the roles of facilitators and guides. Pre/post student data from 2000-2001 revealed a significant *decrease* in the number of teacher-led discussions and an *increase* in open-ended, student discussions. After the *Vista*s, fewer students considered the teacher to be the primary source of information in the classroom. Students consulted experts more frequently, and teachers arranged more classroom guests, videoconferences, and field trips than they typically do.

During *Vista*s, teachers and students used sources such as community and Internet resources significantly *more* often, and traditional resources such as textbooks, *less* often. Teacher survey data collected over multiple years have also indicated a growing use of authentic assessment strategies; student data have reflected corresponding increases in opportunities for peer and self-evaluation and presentations.

Provide more opportunities for collaboration and developing interpersonal skills. Data collected during the 2003-2004 school year shoed that just under half (43%) of the *Vista* students said they collaborated with their peers more often than they typically do in school. There was also a significant difference ($p<.01$) between how much time *Vista* students spent collaborating with one another and the frequency with which non-*Vista* students worked together on projects. Just over half the *Vista* students (51%) credit their *Vista* experience with facilitating more effective collaboration skills.

Engage students in critical thinking and problem solving. High percentages of high school students participating in the 03-04 study said the *Vista*s also required them to use critical thinking (76%) and problem-solving skills (68%). Compared with other long-term projects, half the students said the *Vista* helped them better understand the problem-solving process, while over a third indicated that that they were better able to solve problems (35%). About the same number of students (38%) also said their ability to judge, evaluate, and analyze had improved due to the *Vista* (38%).

Provide opportunities for real, relevant research. The research process is central to the *Vista*s' PBL approach, and students repeatedly say that more than anything else, their research skills improve as a result of their participation. In their research, students report using a wide range of resources and developing the information literacy skills necessary to mine, organize, apply, and cite those resources. In an open-ended response to a question about what 2-3 things they learned during the process of working on their presentation that will be helpful to them in the future, students at the 03-04 Celebration Dinners referred most often to the content of their research. Almost one-third (32%) of their comments specifically mentioned facts, statements, and processes related to the issues they studied. Several students

also commented that they learned important things about the research process itself—collecting data, interpreting and representing data, and making conclusions.

Engage students in more real-world learning activities. 2003-2004 data showed similar trends in classroom changes brought about by *Vista* presentation. Over a third of participating students indicated that they had more opportunities during the *Vista* than they typically do in their classes to make a product to share with others (37%), give presentations (35%), design research instruments (34%), work with real data (34%), collaborate in small groups (34%), and write to real audiences (32%). (The majority of students indicated that they had about the same number of opportunities during the *Vista* as at other times in the same class; very few students said they had fewer.)

High school students said they also had more opportunities to grapple with issues (25%), and were given more responsibility for determining how they would pursue solutions to those issues (24%). Almost double the number of middle school students indicated that these activities were more frequent due to *Vista*: 50% indicated that they felt they had more choice in what they did and how they did it, and 47% said they more often participated in open-ended discussions during *Vista*. Two thirds of the high school students (66%) said they learned how to do new things during the *Vista* process, and over half (56%) indicated that they were engaged in what they were learning. Forty-seven percent of students said that in comparing the *Vista* to other class or school projects, they learned more than they usually do; the slight majority said they learned about the same.

Students in these classrooms:

Demonstrate better problem-solving skills. Data from a problem-solving assessment administered in 2001-2002 showed that *Vista* students demonstrated higher-level thinking skills than their non-*Vista* peers. Analytic scorings of these assessments indicated that *Vista* students were better able to outline a research plan, formulate specific research questions, identify credible resources, collect rich data, and

reach logical conclusions. Findings were consistent in studies conducted in two different years, with academically-matched students in the same school.

Teacher pre/post survey data also reflects measurable differences in specific critical thinking skills. Over the course of the 2001-2002 *Vista*s, a majority of teachers indicated a "great" or "significant" difference in students' abilities to paraphrase ideas in their own words (67%), find new solutions (57%), and assess statements and arguments (57%). During the *Vista*s, teachers also reported enhancing their teaching with a variety of resources and research methods, and shifting towards instructional practices that encouraged "sense-making" and thinking.

THE ROLE OF TECHNOLOGY

CILC *Vista* students and educators utilize technology throughout the course of their program. Videoconferencing allows students to collaboratively connect to community constituents and experts as they study their issues, investigate important research, and share their findings for thoughtful comments. In addition, they utilize the videoconferencing facilities to learn content pertinent to their program. Finally, videoconferencing is a great tool for building reflective student and educator cadre groups to share thoughts and analysis as they proceed, and to share their presentations spots.

The CILC *Vista* program also encourages the utilization of a number of computing skills, as students prepare meaningful presentations, telling their story in power point or movie productions. During these presentations, students must create short, to the point dialogue that illustrates their data (use of Excel charts and graphs), communicates their points and presents their reasoning. This allows students to utilize a number of presentation software tools in meaningful ways tied to curriculum intentions. In addition, students learn to navigate the internet in a useful way, gathering their research and citing their work.

Finally, students tie the use of email and phone etiquette to their work as they communicate with one another, other students and community support. In addition, some students are learning to develop web sites that communicate their knowledge beyond their community to the world.

Research shows that, during a *Vista* project, teachers:

Use technology as a teaching and learning tool. Over the years, pre/post data have shown consistent increases in teachers' technology use during the *Vista*. While the most significant increase is almost always in teachers' use of videoconferencing, increases in teachers' and students' use of the Internet, graphics, email, and PowerPoint are also evident: in a recent survey, 82% said they used the Internet "often" or "almost daily" during the project. Student data corroborates this finding: 74% of students said they regularly conducted research on the Internet during the *Vista*, as opposed to 45% at other times. With increased use comes increased proficiency. Data from 2000-2001 show that 80% of teachers increased their general computer expertise at least slightly during the *Vista*. Over half the teachers said that the *Vista* increased their proficiency in using the Internet as a tool for learning. The most marked increase is in teachers' use and proficiency with videoconferencing: 63% of first-year *Vista* teachers indicated a "moderate" or "significant" increase in their ability to use videoconferencing. Student data indicate a significant increase in the frequency with which videoconferencing is utilized during a *Vista*.

Increase the frequency with which teachers and students utilize technology. Our surveys and interviews with teachers and students show that participants are comfortable with technology and are proficient using it in multiple ways to access, organize, and evaluate information, to communicate with others, and to create and disseminate products. Even so, the data collected from multiple years show increases in the use of technology during the *Vista*s, and in students' and teachers' proficiencies with technology due to the project. Proficiency increased with use; as students and teachers utilized technology to research, collaborate, and communicate, they also became more efficient and effective users. In one study, almost one-third of *Vista* students (32%) said they used technology more often during the *Vista* than they typically do for school. And, the middle school survey data showed a significant difference ($p<.01$) in the

frequency with which *Vista* students used their laptops (*M*=2.99 on a 3-point scale, where 3=more often) compared to the frequency with which non-*Vista* students used computers (*M*=2.34) during a comparable long-term project.

Other benefits/findings:

Vistas help teachers meet academic standards. Teachers in all the *Vista*s have successfully integrate the problem-solving process into core courses while teaching required state academic standards. The multi-disciplinary nature of the *Vista* issues also helps teachers incorporate standards from other content areas. For example, every teacher in the 2001-2002 year indicated that students learned what was required in the state academic standards *better* through the *Vista* than through previous methods. These teachers also felt that students learned the content more thoroughly and would retain it much longer.

Vista students use data more frequently, accurately, and persuasively. Analysis of student scores from a standards-based math assessment, administered in 2001-2002 to two teams of 8th grade students in the same school, showed that CILC *Vista* students, in contrast to their counterparts, were more accurate in their calculations, more organized in their presentation strategies, and more logical and innovative in their solutions. The average holistic score for *Vista* students was 3.6, compared to 2.4 for non-*Vista* students. Student pre/post data indicates increased numbers of opportunities for *Vista* students to work with data, and teacher data reveal growth in students' abilities to collect, analyze, and interpret diverse sets of real-world data important to their *Vista* research.

Vista studentsre more positive about school and learning. Over the years, students have consistently said that what makes their *Vista* experience different from any other school project is that the issues are real and that they can make a difference in their communities. This translates into higher motivation about school and learning. Over half the students in the Northeast Corridor Classroom rated their classes more highly after their *Vista* experience. Upon conclusion of the 1999-2000 *Vista*s, students found what they were learning to be more interesting, more important, and more relevant. Even those teachers who

typically use more constructivist practices say that *Vista*s out-distance other activities, motivating students to explore, collaborate, thoroughly research solutions to problems, and present these to community partners with the skill of professionals.

The CILC *Vista* model has been developed with educators as the designers, since its inception. As a result, the program hosts a variety of examples of successful implementations. Educators in small rural school communities, suburban communities and large urban districts have implemented this program. Examples of entire school, small one classroom models, student government programs, pull out groups of students and interdisciplinary team models have been successfully implemented. Therefore, this program has illustrated its flexibility and transferability among educators and students. The framework design is consistent, yet adaptable enough to blend and modify for a given educational model.

Prospects for fostering global connections are the next natural step to the CILC *Vista* program. As early as this year, we have begun to foster current educators to think outside of the United States and consider sharing their meaningful engagements with students globally. Students throughout the world deal with similar issues impacting the viability of their communities. As educators and students successfully build models to engage with their community, it is important that they reflectively engage with those from diverse communities, the framework is here, now we extend beyond our traditional classroom to the world, through the web, videoconferencing and beyond.

[i] For a discussion of constructivist approaches and the value of using complex problems to encourage higher-order thinking, see Becker, 2000; Howard, McGee, Schwartz, & Purcell, 2000; Gallagher, 1997; Savery & Duffy, 1995. See also bibliography.

[ii1] ROCKMAN *ET AL* was established by Saul Rockman in 1990 after leaving the education marketing group of Apple Computer where he was manager of education research. The company, which has offices in San Francisco, California, Chicago, Illinois, and Bloomington, Indiana consults with corporations, state and federal agencies, and educational organizations on research, evaluation, and policy development that advance the application of technology to meet educational and business learning needs. The staff of ROCKMAN *ET AL* includes evaluators with advanced degrees in education, cognitive science, psychology, telecommunications, and policy analysis who are skilled in a wide range of quantitative and qualitative research methods and data analysis strategies.

Current and recent clients of ROCKMAN *ET AL* include: Adobe, California Department of Education, Classroom Connect, Compaq Computer, Co-nect Schools, the Corporation for Public Broadcasting, Harvard Graduate School of Education, Indiana's Buddy Project, Indiana Department of Education, the Joyce Foundation, Microsoft, National School Boards Association, Scholastic, Teacher Universe, Toshiba, and numerous U.S. Department of Education and National Science Foundation projects. For reports and further information, see www.rockman.com.

[ii] *The Civic Responsibility Survey for K-12 Students Engaged in Service Learning*, developed by Furco, Muller, and Ammon, 1998.

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