The Perceived Level of Distance Education Technology Effectiveness: A Case Study of Selected U. S. High Schools

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Abstract: *This article is an excerpt from a previous research. The study was a qualitative case study and the purpose was to explore the effectiveness of educational technology in a distance learning environment in the United States as a whole and to identify strategies for using best practices established in U.S.-based distance education programs as a basis for developing a model for other systems.*

To preserve anonymity of the cases and participants involved in the study, all names were changed to pseudonyms. The schools are identified as follows: Private School A (PSA), Private School B (PSB) and Online Public School (OPS). Private School A participants are designated with the names John, Janet, Teresa, Jerry, Elizabeth, Mathew, Cynthia, Ben and Stacy. Private School B participants are designated as Boris and Jonathan, and the OPS participants are named Andrew and Samantha. The study findings can inform institutions where quality education is needed to better prepare under-served school populations for higher education and for further contribution to the development and prosperity of that nation.

1. INTRODUCTION

Technology plays a major role in the educational world (Monolescu, Schifter & Greenwood, 2004), and has been credited with reducing the educational gap between developed and developing nations through distance education (Breen, 2006). Learners around the world are demanding anytime and anywhere forms of education, and learning institutions are responding to that demand by implementing various forms of digitally-based education (Schrum & Hong, 2002).

Distance education is not a new concept, but in recent years, it has assumed markedly new forms and greater prominence. Now, it is one of the fastest growing forms of education and is becoming more a part of mainstream education through courses taught by Internet or videoconferencing (Ashby, 2002). In a very short period of time academic institutions have been provided vastly expanded opportunities to provide a flexible and more open learning environment for students, and this trend continues as the technology continually improves (McIsaac & Gunawardena, 1996). In view of this, the need to explore the effectiveness of distance educational technology is expedient.

The research question that guided this study asked: *What is the perceived level of program effectiveness among selected U.S. high schools currently using interactive distance educational technology?* As the purpose of this research was to make recommendations for the introduction of similar programming in under-served communities, the effectiveness of programs delivered through a medium similar to what is proposed is pertinent. Therefore, the perceived level of program effectiveness among selected U.S. high schools currently using interactive distance educational technology, as explored by the three cases that comprise this study, became one of the focus questions of this research.

The growth of distance education has prompted researchers to examine its effectiveness within the context of traditional classroom systems (Bernard, Abrami, Yiping, & Borokhovski, 2004; Cavanaugh, Gillan, Kromrey, Hess & Blomeyer, 2004; McIssac & Gunawardena, 1996). Schools exist to serve societal interests, and people by nature tend to have interest in engaging in activities that produce results. The schools involved in this study shared a focus on serving their communities and the larger society. To accomplish this, all of the schools also maintained a

focused, result-oriented agenda. The question of how schools perceived their success in accomplishing their stated agendas was the central issue of this research question. The following interview questions provided the basis for data collection to answer this particular research question:

- IQ 1: How was your program funded at the beginning and how is it funded now?

- IQ 2: How cost effective is it to operate distance education at your site?

- IQ 3: How do students interface with your delivery program? For example, how do they receive class materials, interact with classmates, respond to instructor, submit assignments, etc.?

- IQ 4: What level of satisfaction do you detect from students in the program?

- IQ 5: How satisfied with this program are the parents of your distance students

- IQ 6: According to the constituency your program serves, what is the perceived level of success of your program

In line with the above questions, categories related to evaluating program effectiveness, student/parental satisfaction with program were identified and are discussed in the following sections. These categories emerged from the interview questions and are the result of building a logical chain of evidence through pattern-of-commonality identification in line with the research question (Creswell, 2007; Davies, 2007).

2. EVALUATING PROGRAM EFFECTIVENESS

Mateo and Sangra (2007) believed that program effectiveness, rather than being measured solely in terms of student learning achievement or success, should be related to the effectiveness of the instruction that take place in the classroom as well as considered in relationship to other issues. For this reason, Mateo and Sangra raised the development of a formative assessment system as a major feature for distance education instruction. All three institutions spoke about the importance not only of effectiveness but also of regularity needed in systematic measurement of the instructional effectiveness. The definitions they applied to the term ‗effectiveness' and the strategies for approaching evaluation varied by institution. Effectiveness was variously measured in terms of growth in student enrollment, students' ability to go to college, academic performance, and recognition by society. Along with this major theme, sub-themes such as cost effectiveness and funding of the programs by the various institutions are also discussed.

PSA measured its effectiveness by the number of students that continue on to college upon completion of the program. According to Ben, PSA program director, a large percentage of their students pursue a college education. In his own words he posited, ―*Not only do they go to college, they perform well at the college level and are able to graduate with college degrees.*

However, Ben could not provide statistical data to support his claim as he admitted, ―*We do not have statistical data as of now.* In addition to the rate of college attendance, PSA effectiveness was also measured in terms of growth in student numbers as well as the program's ability to sustain itself. Jerry, the superintendent for PSA, explained:

When we started off, we had something like 50 or 60 kids in the one-to-one program. Now we have a hundred and some kids. And we'll consistently have 100 to 120 kids in the one-to-one program. When we came here and started the one-to-one program, we had one or two schools. Now we have 11 schools, and we have about 85 kids involved. So I think we would say it's been effective. Financially, PSA not only pays for itself, but we think as we progress and now expand what we're going to start expanding, it'll actually make some money for us.

Andrews, the vice president for OPS, measured the effectiveness of their program in terms of growth in student enrollment, awards won, and students' academic performance. He explained:

We started with a very small group of 77 kids. Last year we served over a hundred thousand kids in this state alone. This year we will probably serve about 120 to 125 thousand students. . . . And then we have all the other state programs that we work with, which is what I call Global Services. We actually grow about 40 percent a year. We have this year what we call

180 thousand enrollments. Most of our kids take one to two classes with us, so that's about 120 thousand students that we serve. We're growing like crazy. Most of our kids have higher grades than the traditional kids. Now a lot of that is we're a mastery based system. So if a child is not finished with a chapter, you know, that's fine; we wait until they are finished. Or if they take a test and they fail, we have them take it again until they've mastered it, until they've actually been successful in doing it. So, our grades might be a little higher, but we want them to actually learn. It's not just taking a test. It's actually learning something.

Even though it is now defunct, PSB also claimed to have been effective. Boris, the initiator/director for the program, was initially hesitant to admit that their six years of operation could be called a success. In responding to the question regarding program effectiveness, he

remarked, ―*Well, I don't know if you would call six years a success.*‖ But he continued, ― *I think we were effective to some extent. We had about fifteen of our students who graduated to college.* PSB's program was the smallest in enrollment among the three studied cases involved in this research. Its total enrollment was between 24 to 30. PSA measured it effectiveness in terms of it student population and the program's ability to pay for itself and also measured it based on their students' ability to go to college. OPS measured it effectiveness in terms of growth in student enrollment, academic performance, and receipt of awards. All three institutions emphasized the effectiveness of their programs. The definitions they applied to the term ‗effectiveness' and the strategies used to approach evaluation varied by institution, but emphasis by all of the schools was placed on identifying opportunities to assess the effectiveness of their program and its true benefit to students.

3. COST EFFECTIVENESS

Butcher (2000) defined cost effectiveness as striking the optimal balance between cost, student numbers, and educational quality, a balance that, according to Butcher, will be entirely different for different educational contexts. The Oxford English Reference Dictionary, on the other hand, defined cost effectiveness as productive or economical in relation to the cost. The studied cases explained the cost effective nature of their programs, but they did so in different ways. PSA believed their program was currently cost effective. Initially, the program was run with or through satellite, which, according to Elizabeth, a PSA pioneer, ―*was very expensive.* The satellite was replaced with Integrated Services Digital Network (ISDN) lines, which were also ―*expensive.*‖ At the time of the study, PSA depended on high speed Internet, available for a reasonable cost. According to Mathew, the technical director at PSA, the Internet has made the program operation ―*more cost effective than operating a medium-sized academy.*

He explained ―*that the most expensive equipment among all the equipment is the ‗bridge'—the hardware that distributes all the connections to the various sites…But once the initial expense is overcome, the program becomes self-sufficient.*

Mathew further explained the cost effectiveness of the program from ten years back until now. He credited the cost effectiveness to the fall in price of the main delivery equipment, the bridge.

The bridge that the program started with allowed for something like 12 locations to be able to connect over phone lines into a central box—some small number. That box was maybe 4.5 feet tall and about 3.5 feet wide, to facilitate all of that. And it cost almost a half a million dollars. OK, that was 10 to 11 years ago. By contrast, a box that allows for about 80 connections is the size of a 1 U server in a server rack, about 2 inches tall and about 19 inches wide, and it costs, with support for three years, less than 90,000 dollars. You're looking at about--on a large scale of $1,000 per port. But that's a port that can work for you 24 hours a day for you, seven days a week and never fail. So with this fall in price, we operate on a pretty much good budget which is cost effective.

Ben, the program director believed the program could be more cost effective if run as synchronous and asynchronous. He explained,

One other way we would be a little more cost effective is to make a larger portion of our curriculum asynchronous. In other words, the dynamic of the camera is an amazing dynamic. It really is. I mean a lot of the reason for that is the relationship building, and the bonding

and all that type of thing. But it's also costly, and it's what we called synchronous. You have to synchronize everybody's schedule. Well, that's challenging. But if we could do more classes asynchronously, it's less costly. There's more flexibility. You're not worrying about the camera. You don't have that cost in there, and it's far more flexible. So some combination of both, I think, realistically we could get to where we had a whole stand-alone asynchronous program that would be cheaper than this—and more cost effective. So in general, I think having a combination of the two will help us to be more cost effective.

PSB also believed their program was cost effective. Jonathan, a former teacher at the school, explained the cost effectiveness as follows:

We had 22 students and two teachers, but one advantage we had was that both of these teachers taught in the local classroom like seventh and eighth grade. I taught seventh grade, and then I would teach a couple of classes on line. And when I taught on line, the other teacher would go and teach my science class for me. So we had this relationship where we were sharing. Beside, we had 22 students, and so financially it was working because there were enough students to pay that tuition and help pay for the expense of the program.

Speaking on the cost effectiveness of their program, Samantha, e-solution manager at OPS, explained,

I think we are extremely cost effective. It's not cheap to have a virtual school, but it is cheaper than having a regular school. We don't have buses. We have one block building for office, but we don't have a whole huge school with thousands and thousands of kids. I mean we're a huge district. We have 700 teachers and at any given time 65,000 students. But we don't have them sitting in any facility that we are supplying electricity for. So, all of these kinds of things make it extremely cost effective. Our teachers all work from home. I used to drive 45 minutes each way to work, but now I work from home, which is good for the organization and also better for the environment because our teachers work from home.

All three sites claimed to be cost effective, though again each school provided a different example of its cost effectiveness. PSA participants measured cost effectiveness in terms of no huge expenditures for a large facility, low costs for high speed Internet, and self-sufficiency of the program after overcoming the initial expenses. PSB leadership measured cost effectiveness in terms of the ability of sufficient tuition to off-set operating costs. OPS interviewees provide the example of not paying for a physical school structure and its accompanying maintenance and utility expenses as showing their program's cost efficiency. Appendix D shows Table 5 with Online Public School operating costs for the 2009-2010 school year.

4. FUNDING

The integration of funding considerations in program planning and budgeting has been recommended as well as periodic program administrator audits of tuition rates to assure that they are competitive with other programs (DiPietro, et al., 2008; Evans et al., 2007; Levey, 2003). In this study, funding levels and sources of funding varied by institution, but the need for a solid financial footing was echoed in all of the interviews. PSA's program has been funded by various levels of its church's organization and was currently funded by the local conference/school district. Tuition also contributed to PSA's income. Ben, the director, noted that the support received from the conference and the tuition collected from students enabled him to balance his budget, thereby making the program viable. He explained,

My budget right now is about a quarter of a million dollars to operate this program. But if you look at it from the standpoint of how much involvement financially they've had, we've gone from a half a million or more, to $150,000. So the $150,000 plus the operational revenue that we receive through the program tuition and any other funds that we can generate enable me to balance my budget.

But unlike PSA, which was funded by its church organizations from the beginning through the time of the study, PSB, although also a church institution, did not have the same advantage. PSB was funded through a donation from a wealthy couple belonging to the school's church organization. After the initial funding, PSB could not generate enough money to sustain itself, and

this contributed to it collapse. Boris, one of the initiators/directors for the program, explained how the funding was obtained to start the program:

> *The conference either was't able or wasn't interested in funding the program, nor was the union, and so we went to local funding for initial funding. We found a wealthy individual in the church that was willing to give us seed funding to be able to get started in order to buy some of the computer hardware, get the Internet connection, and some of the software to get started.*

In comparison, after acquiring the seed money to start its program, PSA became viable through tuition. However, the tuition could not cover all the expenses necessary to sustain the program. It was able to avoid PSB's fate, however, by means of support from higher administrative levels during its formative years. OPS, on the other hand, started with a grant. Andrews, the vice president for global services, explained the genesis of their program and its funding:

> *A grant was first given to a group of educators who were put in a room to think of something different. It was a creativity and —out of the box thinking grant. It was about $200,000, and it was to be used to think of a way that we can reach kids in education. Is there something that we aren't doing today that we could do? And they came up with an on-line program, which became Online Public School. They created an on-line course. The first class they taught was actually AP computer science. It was 77 kids from this area. They did very very well. The governor started taking note of this project. So, then what he did is that he funded it from his governor's budget, gave them some more money to expand a little bit. And then the state legislation saw that this was a good thing, and so somewhere around the year 2001, I think it was, they actually made OPS a district within the state. And the law states that any public school, private school, or home school child in grades 6 through 12, may take any of our courses for free and the state will pay for that. If it is a public school child, they have what they call the FTE, the Full Time Equivalent, which is how the state pays for its students to the school districts. So if a student takes the course from us, the state pays us and does not pay the school district for that student's course, for one course. If it is a private school child or home school child, the state pays us directly. So we are a state-funded organization started with a grant, to try to do something different for kids.*

All three institutions had various levels of funding. PSA was funded by a blend of church-backed financial support as well as tuition. PSB initially enjoyed funding from a wealthy individual belonging to the church, but once that was lost, the program could not sustain itself. OPS enjoyed state funding and also generated revenue by re-licensing its program content to other institutions. When the study was conducted, both PSA and OPS were still operating, but PSB was defunct due to a lack of sustainable funding.

5. STUDENT/PARENTAL SATISFACTION

Student/parental satisfaction was another category that emerged from the data analysis. Student satisfaction may play a key role in education in either traditional classroom or in distance learning environments. Satisfaction of students may affect continuity of a school's program because unsatisfied students may opt out of the program. In order for students to be satisfied, they need all the support given to students in traditional learning environments such as a library, bookstore, access to the right equipment and technology, etc. (Benson, 2001; Schrum & Benson, 2003). Participants in this study consistently expressed the importance of student/parental level of satisfaction in their various programs. They also felt that they were meeting the expectations of the students they serve. Teresa, administrator/instructor at PSA, postied,

> *I've heard very positive things from both parents and students and local sites. I mean, you're always going to run into problems or always going to run into people who are unhappy, or you'll run into a situation where the program just doesn't work for that particular student. The student may have some special needs, and it doesn't work in this environment. But on average, people are very happy with it. And they tend to keep their students in the program all the way through. Most of our students go on to college, and they're very successful there because they've learned to be independent and how to study on their own—more in this type*

of an environment than they would in a traditional environment. So they've gained skills that help them once they go to college.

Stacy, also at PSA, believed reinforcement is key in promoting student satisfaction in this kind of learning environment. She remarked,

The students, when they receive positive reinforcement from teachers—that for them is a win. When teachers are able to say, ―You did well at this, then they feel like they are doing well in the program. When the teacher could skillfully say, ―Look how you have grown. Look what you've been able to produce and to do; you need to take pride in this. This is great, then their satisfaction becomes self evident. That's the way it is for all of us. And then to somehow have a component where you turn that into a letter grade, then they become more satisfied.

John, also a teacher at PSA, believed motivation is a key to success in this type of learning and that the facilitators at the sites could be of more help to the unmotivated ones. He offered the following:

Here we get into What is the type of student that does well in this kind of program? A student who is lazy--doesn't really like to be pushed--is not going to do well. A student that is highly motivated, self-motivated, doesn't need people behind him pushing him all the time, will do well. Those that are self-starters, those that like to learn outside of class. These are the ones that are going to do well in the program. So, when we recruit, we give the criteria of the kind of student that's going to do well with the program. Another factor is Are they at a site that has good supervision? If they're at a site that has good supervision, and the person that's there is not just going to sit in the corner unless they start being too noisy, if they're actually there, checking to see that they're on task, checking that they're doing their work, checking their work to see that it's done, then even some marginal students will make it. But if you don't have that person there, then it's only the highly motivated students that are going to make it.

Boris, initiator/director for PSB's program, also expressed his view on the satisfaction level of their students.

In terms of student satisfaction, we found that students seemed to really enjoy working online. I think that they did miss meeting face-to-face with students and a lot--with their peers anyway. In a lot of cases they had local students that they were there with, perhaps younger students. They might be 9th or 10th graders at a local school and the rest of the students were 1st through 8th grade. So they missed having students of their age. But in terms of class work, I think they enjoyed that. I don't think that I ever had students that said they didn't like the program. We did have a couple of students—and I think you would find this in any program— we did have a couple of students that just didn't work out in the program. I don't know if it was the distance education, or whether it was the students. They just weren't going to work out in the school program period, and they might not have worked out in a regular classroom either. So that might have been the case anyway. We did do assessments on a yearly basis. We did surveys on a yearly basis. Actually we did assessments—one or two a year—to determine the levels of satisfaction. And those assessments went to parents also and teachers who were supervisors at the local level.

"Jonathan, PSB teacher, also offered his view on students' satisfaction, which is mostly in line with that of Boris. However, Jonathan's view on assessment differs from Boris 'position".

A lot of our students came from home school situations or very small schools, and so it was satisfying to be able to go to school with other kids their age, even though they were spread by a very great amount of distance. They became good friends through texting each other—I mean sending messages to each other. And then we had one trip a year that we would invite all the kids and got to see each other. And we would do something educational but fun for them. So they really loved the program. Almost all the kids really enjoyed it. There are some kids that just can't stay sitting in front of a computer all day, so it's not for every kid.

Samantha, e-solution manager at OPS, also offered her thoughts on student and parental satisfaction:

I think they're very satisfied. I think that they are not used to having a teacher call them every month just to talk to them, not because there's something wrong, but just to say,

—*This is what's going on. This is how your student is doing. We do welcome calls between the teacher, the parent, and the student in the beginning of each class when we start a student. We all get on the phone together, and we talk about expectations, and we just meet each other. And we say,* —*We're a team. We're a team of people who all want this child to be successful. And that doesn't happen very much in a brick and mortar school, sadly. There's that strange disconnect. So I've become very close to parents. And sometimes they would just call me. They usually become very free to just pick up the phone and call you when they suspect there's a problem. The grade book is wide open too. We have a guardian account so that a parent can log in any time and see the progress of their student. They can see what assignments have been submitted, how far into the program they are, what their grades are, and the feedback they have received—— almost everything. Parents really can see what's going on and can call you any time, just like any parent. They can be as involved as they want, but it's an expectation that we will speak to parents once a month.*

Andrews, vice president at OPS, stated how they measure students' satisfaction and the feedback they get from both students and parents

We actually put every student through a survey that it's an optional survey at the end of their course, and we learn from them what they liked and what they didn't like. And we try to take that information and improve ourselves. Overwhelmingly, the students like what they're going through. That's what our data is indicating to us, that they have been very happy with our on-line program. The feedback that we get from parents is sometimes very emotional: that we have saved their child from dropping out, that we have gotten to this child, that no one else has been able to get to them before, and that our teachers are just amazing. So the feedback is very positive——and again sometimes very very emotional——that we have.

All three sites claimed high levels of student and parent satisfaction. According to PSA, their students are satisfied with their program as a result of their ability to attend college and be successful. Positive reinforcement, good grades, good site facilitators, and the motivation level of students result in satisfaction. PSB highlighted its student and parental satisfaction based on the opportunities for online socialization, field trips, and the fact that they received no complaints about the program during its existence. OPS monitored the satisfaction of students and parents through phone calls placed to the student. Friendly relationships between teachers and parents as well as parental involvement in various school programs resulted in positive views of the school. Emotional feedback from parents stating how the program has saved their child from dropping out and the fact that students stay in the program are indicative of satisfaction.

6. SUMMARY

Interviewees' at all three institutions spoke to the importance of measuring effectiveness in general and of regularly and systematically measuring the effectiveness of instruction. The definitions they applied to the term effectiveness' and the strategies for how to approach evaluation varied by institution, with measurements varying from enrollment trends, college admissions, academic performance, to increased recognition.

Private School A (PSA) measured its effectiveness in terms of its student population and the program's ability to pay for itself. Private School B (PSB) measured its effectiveness in terms of the number of student graduates who gained entry to college. Online Public School (OPS) measured effectiveness of their program in terms of growth in student enrollment, academic performance, and receipt of awards. Growth in student enrollment gave both PSA and OPS proof of their program's effectiveness.

All three institutions believed their programs were cost effective. PSA related its cost effectiveness to reasonable Internet service and technology/equipment costs. PSB attributed its cost effectiveness to student enrollment and tuition revenues to cover operation costs. For OPS cost effectiveness came in the advantage of running a virtual program and not having to pay for costs associated with running a brick-and-mortar campus.

From the three schools' responses, it was evident that cost effectiveness grows over time and that large initial outlays of capital can require institutions to actualize their expenses and savings over a number of years to get a true picture of the actual cost of doing business. An additional point worth mentioning is the low overhead that accompanies virtual schools in the form of classrooms and costs associated with running a brick-and-mortar campus. This element of cost savings, as highlighted by OPS, has the potential to offset some of the added costs that are associated with technology investments.

All three institutions had varied levels of funding. PSA's program was funded by various levels of its church's organization and is currently funded by its local conference. PSB was funded by a private individual and later supported by tuition. Due to financial constraints, however, PSB had to abandon their distance education program. The OPS started with a grant but was currently funded by its state and also generated revenues by re-licensing its products to other institutions. The unfortunate story of PSB as compared to the successes being enjoyed by PSA and OPS, underscored the importance of securing not only start up funding but determining the level of sustainable funding that will extend beyond the initial start-up phase and support the institution as it grows. PSB's failure to do this was the ultimate source of its failure, and the funding factor must be considered in the planning for the proposed distance education program in Ghana as well. All three sites claimed high levels of student and parent satisfaction, though each school documented the satisfaction of these groups differently. The fact that all three sites placed emphasis on student and parent satisfaction indicates that identifying ways to support such satisfaction will be important as other systems education plan for distance education evolves. Developing programs to the satisfaction of students is a priority for online education. As one subject noted, parents keep bringing their children, and this indicates their satisfaction with the program. If they were not satisfied, students would not continue to be enrolled.

7. CONCLUSION

The primary purpose of this research was to examine successful and unsuccessful distance learning programs and use these data to inform the development of a distance learning programs in other institutions. The three schools studied successfully started and ran their programs for several years. Funding was different in each school, and two of the schools were able to secure sustainable funding. One was unable to continue because they had depended on a single funding source and did not develop new streams of money. The loss of funding suggests the importance of securing initial and sustainable funding when developing a distance learning program.

An examination of the themes revealed that no single issue determines the success of a program but rather a multitude of issues, including program development, attention to technology, hiring and retaining qualified staff, implementing sound assessment, and securing initial and continuing funding all contribute to success. Training teachers and students to be successful is a complex but necessary component of beginning and maintaining a successful distance learning program.

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