

Decreasing the Digital Divide: Technology Use for College Preparation Programs

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## Executive Summary

This paper examines the use of instructional technology for college preparation programs. Over the last decade, the proliferation of personal computers and internet access has led to the widespread adoption of instructional technology in all educational sectors. In this paper, we provide a typology of instructional technology specific to college preparation programs and include examples of how technology can be harnessed to compliment and supplement current initiatives designed to promote college going. Distance learning technology, video games, and networking websites can offer new ways to provide college-going support to students of all ages. General areas that may benefit from further use of technology include: academic support, college knowledge, social support, and family education and support.

The adoption of instructional technology in college preparation programs requires several considerations. We offer five recommendations when considering technology for college preparation programs:

- Technology is expensive and takes time.
- Technology requires access.
- Cultural differences and learning styles are factors.
- Technology must be purposeful.
- Structure and media does matter.

College preparation programs would be remiss if they did not carefully consider each of these recommendations when adopting various media technologies. The adoption of technology to aid in college going has the potential to help students succeed, but should be carefully considered and purposefully implemented.

## Introduction

Computer access and usage in educational settings have increased dramatically over the past twenty years. Instructors in secondary and postsecondary educational settings regularly use instructional technologies. Students are often required to be computer proficient and socialized in learning from technologies. Furthermore, students are now using technology to create social networks and enhance academic involvement. In this paper, we address the following questions: How can technology both inside and outside the classroom be useful to promote college going? How can college preparation programs benefit from the increased usage of these internet networking sites?

We present a typology of instructional technology that outlines the various ways in which it has been adopted in educational settings. At one end of the spectrum is instruction that is fully in-class and on the other is instruction taught fully online (i.e. distance learning). This typology is extended to consider non-classroom based tutoring common among college preparation programs. Technology can be adopted to aid in the college socialization process, understanding financial aid, networking, exposure to instructional technology, college applications, and developing mentoring over vast geographic areas. In addition to the typology, emerging computer-mediated communication and video games can be adapted to promote college going.

The adoption of technologies to promote and support college going requires careful consideration. We suggest that college preparation programs consider cultural differences and learning styles, the expense and time required to develop instructional technologies, structure, types of media, purpose, and access to technology.

With the advent of the Internet and the proliferation of computer use across the educational landscape, technology has become a widely adopted instructional strategy. In classrooms ranging from secondary school through college, students regularly encounter subjects that are taught using technology. Elementary school teachers often turn to videos and computer programs to aid students in spelling, reading, and mathematics. College students regularly sit in classrooms while professors lecture from PowerPoint presentations and present video clips to illustrate abstract concepts. Technology has been seen as beneficial in terms of expense. It delivers education to vast numbers of individuals, reducing the cost of having students and instructors travel to one location. The underlying belief is that instructional technology is equal to or better than in-person learning. However, does the use of technology have a positive impact on student learning over more traditional methods? What types of media are found to be more effective than others? How can college preparation programs use instructional technologies to assist students academically? In addition, pre-college and college students are regularly using internet-aided technologies as communication devices. The popular Face Book, Friendster, and My Space provide individuals with web pages that link them to an ever-growing network of peers. These web pages often facilitate the sharing of experiences and information. How can technology both inside and outside the classroom be useful to promote college going? How can college preparation programs benefit from the increased usage of these internet networking sites?

In this paper, we examine the impact of technology on student learning and explore how college preparation programs can continue to use emerging technology to

promote college going and aid students in the transition to college. We begin by defining the parameters of instructional technology and computer-mediated communication devices. Then we outline the types of media available to facilitate student learning and the emerging technologies that can assist college preparation. We discuss the benefits of learning broadly for college preparation and include implications for its practice.

### Defining Instructional Technology and Computer-Mediated Communication

In this section, we define instructional technology and computer-mediated communication. Instructional technology is a broad concept that attempts to encompass the ever-changing availability of technologies. According to Seels and Richey (1994) instructional technology is the theory and practice of design, development, and evaluation of processes and resources of learning. Instructional technology comes in many forms and uses several different types of media. Applications include writing to read, integrated learning systems, and multimedia. As a widely examined form of instructional technology, multimedia is “the presentation of material using both words and pictures” (Mayer, 2001, p. 64). Multimedia, according to Mayer, relies on how messages are presented and sense modalities using two or more senses (i.e. visual pictures and auditory sounds).

Instructional technologies are typically examined for instructional purposes. Researchers focus on the extent of the usefulness, appropriateness, and benefits of using instructional technology to aid in student learning. However, instructional technology is not exclusive to the traditional classroom. College preparation programs possessing an instructional component and other academically based programs can consider how instructional technology most usefully facilitates student academic progress. In addition, the increased focus on technology in college classrooms provides an increased emphasis

on adopting technology early while preparing students for college. After all, students will be learning from instructional technology in the college classroom and required to use technology to produce classroom assignments. Finally, many institutions of higher education are focusing on computer technologies for basic processes, such as registering for courses. Exposing students to instructional technology early on will only benefit their transition to college.

The second important concept to define is computer-mediated communication (CMC), which is the process of using computers and networks to communicate with people. While instructional technology specifically refers to instruction, CMC refers to all technologies that facilitate communication across great distances and in different time zones. The most common form of CMC is email, but other forms of CMC are available, such as instant messenger and web logs. Certain forms of CMC can also be found in instructional technology including websites that students can access for course materials and information. One popular instructional CMC is Blackboard. Students have access to course syllabi, assignments, and email capabilities and messaging devices that both provide internet based communication with the instructor and other students. Computer-mediated communication will continue to be used for instructional and non-instructional purposes and, therefore, deserves attention in addition to instructional technology. Exposing students to these devices and using them to promote college going have great potential. Therefore, this paper focuses not only on the tradition of examining instructional technology and student learning, but also on the potential for using computer-mediated communication in college preparation programs.

## Typology of Educational Technology

In order to use technology effectively in a college preparation program, it is important to understand the range and types of potential technologies. The definition of instructional technology covers a wide range of practices, different forms of media, and the multiple methods for adopting technology for instruction. Instructors may choose to use picture slides, presentation slides with just words, clips from movies, music, or web pages to facilitate the explanation of a concept and enhance student learning. Other instructors may deliver course curriculum via websites or video and never physically sit in a classroom with a group of students. Sugrue and Clark (2000) suggest that media, as an instructional resource, has a broad range of attributes and capabilities. Each method of instructional technology differs in the process, usage, and potential student outcomes.

Bonk, Cumming, Hara, Fischler and Lee (2000) present a typology of online instruction based on the extent that web-based technology is utilized in instruction. On one end of the spectrum is instruction that fully takes place in the classroom and on the other end is instruction taught completely online (i.e. distance learning). Although this typology is intended for classroom based instructional technology, it can easily be adapted to consider non-classroom based tutoring that is common among college preparation programs. Technology can also be adopted to aid in the college socialization process, understanding financial aid, and developing mentoring over vast geographic areas.

Table 1: Instructional Technology Typology

Fully In-class	Web Supplemented	Web Enhanced	Web Hybrid	Fully Online
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This typology provides a useful method to examine the wide range of educational technologies and how the adoption (and the extent of adoption) of technology impacts student learning. Below, we present a typology of educational technology based on the extent to which media is adopted for instructional purposes, both inside and outside the classroom. The typology presented below is not intended to be web-based, as presented in Table 1. Rather, we use this framework to present a typology of instructional technology more generally and include descriptions of how technology can be adopted for instruction in regards to college preparation programs.

*Fully in-class.*

Some of the first ways in which education technology was adopted for instructional purposes is the use of visual aids. At one point, the blackboard was considered a new technology. Today, educational technology uses other forms of media, such as slides, videos, and internet sites to aid in classroom based instruction. This form of instructional technology is based on a full in-class model where instruction is only delivered in-person with visual aids sparsely used as secondary to traditional instruction. Mayer (2001) suggests that visual forms of instructional technology are effective when developed under certain guidelines. For example, aligning words and pictures on a single visual aid contributes to better transfer and retention for students.

A fully in-class model for college preparation programs refers to instruction that is delivered in person with technology that is sparsely used. This may include after school tutoring with one or a group of students and an instructor who uses technology to illustrate a difficult concept but does not rely on technology to deliver the curriculum. In addition, college preparation programs may consider programs that do not rely on

technology but individual contact to facilitate the college-going process. Individuals tutoring on how to complete financial aid forms rather than using videos or slides that explain the process is one fully in-class programming model.

*Technology supplemented and enhanced.*

Many courses that have adopted some form of media are technology supplemented or enhanced. With the increased use of computers and the availability of technology integrated classrooms, instructors are adopting more complex visual aids including interactive videos and presentations. Mayer (2001) suggests that the attributes of multimedia do not differ according to the media used for instruction. Using auditory text, for example, also enhances student learning. Other uses of technology include Blackboard, a website that allows instructors to post materials and communicate with students in one location.

In college preparation programs, technology enhanced instruction could adopt technologies that supplement in-person instruction or provide additional instructional material using web-based services. A technology-supplemented model also has vast potential for assisting other aspects of college going. College preparation programs could provide in-person instruction to students regarding the financial aid process and also video based guides for parents who will be involved in completing financial aid forms. In this regard, the college preparation program would target both students and parents and provide additional support as financial aid forms are being completed. Parents could use the video as they fill out the forms.

*Technology hybrid.*

A course using technology for instruction 50 percent of the time is considered a hybrid course. Students are instructed half of the time in a classroom using more traditional or technology enhanced instruction and the other half of the course via technology (i.e. use of video or the internet). Although less common, this form of instructional technology is effective when students are not available in-person over multiple week semesters. Mentoring relationships may also benefit from a hybrid model. In a study of long distance mentoring relationships, Burgstahler and Cronheim (2001) found that adult mentoring relationships require some in-person contact to develop trust. Therefore, a hybrid model could allow for mentoring relationships over vast distances but provide more beneficial relationships by also supporting in-person contact.

*Fully online: distance learning.*

One of the most widely studied forms of instructional technology is distance learning defined as instruction that is primarily, but not completely, mediated by technology with little to no physical contact with instruction. Popular, it has been widely adopted across many higher education institutions. Distance learning has three major hallmarks: 1) separation of teacher and student in time or space; 2) purposeful and conscious control of learning by the student; and 3) noncontiguous and mediated communication between the student and teacher (Garrison & Shale, 1987; Jonassen, 1992; Keegan, 1986; Perraton, 1988). Distance learning has several formats. Student may enroll in a web-based course that is conducted over a website (i.e. Blackboard) where they receive email messages, posted assignments, and occasionally use chat rooms to communicate with instructors in real time. Other distance learning programs have web or television mediated one-way video where students are able to view lectures conducted by

an instructor in another location. Finally, some distance learning programs take a hybrid approach and use both web-based instruction and video.

Distance learning instruction and programming has multiple uses in college preparation programs. First of all, it provides an opportunity for college preparation programs to utilize content experts who may not have an opportunity to travel or live in the targeted geographic area. For example, specialized tutors may not be available in-person, but could provide online distance learning. In addition, it allows college preparation programs to target students in rural areas and over vast distances. Students, who have a computer and internet access, can receive the benefits of programs without the requirements of attending specific schools or living in certain urban neighborhoods. Secondly, distance learning is useful in continuing programming efforts once a student attends college. Many students in college preparation programs will attend college across the country making it difficult to provide regular in-person programming. Distance learning can provide instruction, mentoring, and support to students regardless of the schools in which they attend.

#### *Video Games.*

A final typology of instructional technology that is just beginning to emerge is the use of video games. Video games are not included in the typology because the adoptions of this form of technology for instruction is unknown. According to Gredler (1996) video games are characterized by rules, constraints (penalties for illegal actions), and a known end that enables winning or losing. In addition, the games may not directly relate to real world events. In a meta-analysis of video game research over the last fifteen years, O'Neil and Baker (2005) found that games alone are not sufficient for learning. Similar

to Clark's (2001) argument, elements in games are being designed to promote learning (Garris, Ahlers, & Driskell, 2002). Without purposeful instructional design and support, applying games to a learning environment does not result in increased learning (Leemkuil, de Jong, de Hoog, & Christoph, 2003). One of the reasons that games may not have a direct effect on learning is the large cognitive load that is placed on memory (O'Neil & Baker, 2005).

Although video games are just beginning to be examined as an instructional media, they have the potential to assist in the instruction of college-going process, such as filling out applications and financial aid documents and socializing students into the culture and experiences of college. Many popular video games require that users move their character through societies and interact with other characters to achieve various goals (for an example, see the popular SIMS games). College preparation programs could use video games to simulate the college experience requiring students to move characters through the process of preparing for, applying, and navigating college policies and procedures.

#### *Communication Support Media.*

Although not included in the typology (see Table 2) of instructional technology, other forms of communication support media are useful in instructional technology and are popular among pre-college and college students. Instant Messenger, cellular phone text messaging, Face book, Friendster, and other websites are widely used as mediums for communication. Typically, these devices are used for peer-to-peer communication and have, therefore, been primarily unexamined for instructional purposes. However, they each have the potential to be exploited for instructional purposes and are suited for

mentoring relationships that are often integrated into college preparation programs.

Email, Instant Messenger, internet chat rooms, and web logs have been proven to assist in facilitating mentoring relationships, both peer and adult, across great distances.

Burgstahler and Cronheim (2001) discovered that the electronic media assisted in sustaining meaningful mentoring relationships and provided a rich collection of information. Peer-to-peer mentor relationships facilitated over electronic media were found to have more personal content. This finding suggests that peer relationships are easier to develop online, while adult relationships require face-to-face contact. Table 2 provides a detailed description of the instructional technology typology expanded for college preparation programs.

Table 2: Technology Typology for College Preparation Programs

	Description	Example for College Preparation Programs
Fully In-class	Instruction delivered in-person with visual aids sparsely used	Academic tutoring that uses technology to illustrate a difficult concept; traditional instruction is primary
Web (Technology) Supplemented and enhanced	Use of visual aids, including interactive presentations to enhance traditional instruction	Instruction of financial aid forms and policies in-person with web or video based tools online for parents
Web Hybrid	Technology used for instruction 50 percent of the time	Development of mentoring relationships that are mediated 50 percent of the time via technology (email, instant messenger, and video conferencing)
Fully Online (Distance Learning)	Instruction that is primarily mediated via technology	Utilize content experts via distance learning; target students in rural areas who are unable to travel vast distances
Video Games	Computer-mediated games that	Development of games that

	are characterized by rules, constraints, and enables winning or losing	assist in completing financial aid forms and socializing students into the culture and experiences of college
Communication Support Media	Computer-mediated communication that allows individuals to interact	Facilitate mentoring relationships over geographic distances

### Instructional Technology and Student Learning

Instructional technology has been shown to enhance and increase student learning both directly and indirectly over more traditional methods. In a meta-analysis of 184 studies, Pisapia and Perlman (1992) point to an educationally significant enhancement by learning technologies. Students taught with computer-based instructional technology scored higher in academic performance measures than those taught with traditional methods. In addition, newer technologies were noted to be more effective than older applications, and computer assisted instruction was found to be effective for teaching mathematics and language arts (Pisapia & Perlman).

Another application of instructional technology that has learning benefits is multimedia. Mayer (2001), focusing on cognition, argues that multimedia raises student retention and transfer of information. He found that students perform better on transfer and retention tests when they learn from words and pictures rather than from words alone. The effectiveness of multimedia on student learning is primarily explained by cognitive theory. By having words and pictures together, students are able to select images and explanations to understand concepts, hold verbal and visual representations in memory at the same time, and take in only those words and pictures that are relevant to the concept instead of having competing and confusing images and audio (Mayer).

More specifically, multimedia successfully works under five conditions. First, multimedia is effective when there is spatial congruity or when words and pictures are near each other on one screen. Second, temporal congruity is important. Words and pictures should be presented simultaneously. Third, multimedia is most useful when it has coherence; extraneous work and pictures should be minimized. Fourth, words need to be presented verbally, or a modality ought to be maintained. Fifth, redundant words, as speech or text, decrease the effectiveness of the multimedia.

Clark (1983) argues that instructional technology does not directly affect student learning and that media are mere vehicles that transfer instruction “but do not influence student achievement any more than the truck that delivers our groceries causes changes in nutrition” (p. 445). Clark explains that technology can influence the cost and delivery of instruction but does not directly impact student learning. Rather, increases in student learning should be attributed to curricular reform mediated by the use of technology. Often, instructional technology requires that instructors evaluate curriculum and instructional design. Instructors have an opportunity to consider revisions to curriculum and the effectiveness of using technology to enhance and communicate concepts.

According to Pisapa and Perlman (1992), the effect of technology on at-risk student is promising. Many college preparation programs target low-income and disadvantaged students who are less likely to attend college.<sup>1</sup> By adopting instructional technology for tutoring programs, academic instruction, and other forms of learning, student academic achievement may increase thus aiding college going. In addition, instructional technology and computer assisted communication devices may be useful for

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<sup>1</sup> Recent studies have called attention to an increasing “digital divide” or significant gaps in computer access based on ethnicity, geography, and income level.

other purposes, such as mentoring, assistance with financial aid and application procedures, and college socialization. As this paper illustrates, by following several recommendations, adopting technology for college preparation has the potential to enhance college going.

#### Potential Benefits and Uses of Technology in College Preparation Programs

Although there is little research that specifically addresses the use of technology in college preparation programs, we have identified five areas where technology may be useful. Below, we outline each area and provide examples of potential methods to adopt technology to promote college going.

##### *Academic Support.*

Preparing students for college is more than a question of resources and knowledge. It entails appropriate academic preparation, as illustrated in their test scores and grade point averages. Research has noted that instructional technology has learning benefits. When designed properly, it can directly and indirectly assist learning. Proper design includes the adoption of specific technologies that enhance the curriculum and cohesively use a combination of images and words. College preparation programs providing academic support may benefit from introducing instructional technologies. Classrooms may adopt computer aided instruction, online tools, and computer-mediated academic support to facilitate student learning in partnership with college preparation programs. Similarly, non-classroom based tutoring may also adopt similar technologies to compliment and supplement in-class instruction. Other options for adopting technology for instructional purposes include fully online courses using the internet to reach students

over vast distances. These distance courses and tutoring services could be conducted live with students interacting with the instructor.

Broadcasts are often recorded and accessible later for additional viewing. Instructional technology can supplement instruction and also expose pre-college students to learning via technology. College classrooms regularly use some form of media to supplement instruction. Over the last ten years, distance learning has gained in acceptance and usage. Instructors often use PowerPoint slides or video clips to illustrate a complex topic. Instructors also use web-based tools to post announcements or other course materials. Students who enter college without some knowledge of the internet and experience in learning via other forms of technology may academically struggle. Low-income students of color are more likely not to have access to computers and less exposure to instructional technology (Fox, 2005; NTIA, 1995). Therefore, college preparation program, specifically those who are targeting low-income students, could benefit from adopting technology to expose students to technologically advanced instructional methods. For example, instructors who use PowerPoint slides may provide them as handouts. Students need to learn how to take notes from slides rather than only from auditory lectures. College students are also regularly required to use word processors to complete papers. College preparation programs can provide instruction in how to use computers, specific programs, and the internet to search for resources. Each of these computer-tutoring sessions would occur before technology is introduced in other aspects of the program.

*College Knowledge.*

One of the more complicated tasks in applying for college is completing the FAFSA, the form that allows students to apply for federal financial aid. This financial aid form has a range of difficult financial questions that are difficult for even the savviest families. Low-income and first-generation students and their parents have a difficult time completing the FAFSA. Many students rely heavily on federal financial aid to pay for college tuition. These forms are now fully online and require a significant amount of personal financial information. Students and their parents need to have knowledge of the internet to complete the financial aid forms. In addition to federal support, state and local governments also provide resources for financial aid that are accessible through the internet. To use many of these technologies, individuals need to be proficient in computer use. College preparation programs need to consider incorporating technology throughout their programs. Asking students to use an online tutorial when they are not internet savvy would be counterproductive.

Technology in multiple forms can assist students and families in completing financial aid forms. Videos can give step-by-step guides outlining and explaining each question. Email and instant messenger support could be available during specified hours to provide additional and specific instruction. Interactive video games can also provide instruction on completing the forms. For example, an internet tool could be developed that asks a series of simple questions (potentially in many different languages) to complete the complex financial aid forms for the students and their parents. The process would be simple for the applicants, yet complete the forms as required. A model for this suggestion is TaxCut, commonly used tax software. College preparation programs can benefit from developing and using technology to assist with the financial aid process.

Before students are able to enter higher education and begin the financial aid process, they must undergo the process of choosing and applying to college. Selecting a few colleges among the thousands available and researching their application process can be a daunting task, particularly for those students who do not have adequate preparation and support. Furthermore, colleges continue to provide a wealth of information on their curricula, application procedures, services, and campus facts. The college application process is almost entirely online therefore requiring students to have access and knowledge of web-based applications. Students now need to understand how to use the internet to identify colleges and undergo the electronic application process. College preparation programs would benefit from programs that assist students in the “nuts and bolts” of the internet and the specific tools that are required to search for and complete college applications.

Several specific uses of technology are often overlooked when designing programs that assist students with online technology. To sign-up for online materials and to apply to colleges, students usually need an email address that they can regularly check. Without access to computers or knowledge of email services, students may be at a disadvantage. Similarly, students may be required to upload personal statements to the application websites requiring that pre-college students understand how to use word processors, upload documents to the internet, and understand document converters (such as Adobe Acrobat). To assist students fully, college preparation programs need to consider all aspects of the process.

Preparing student for college includes exposing them to higher education’s policies, procedures, expectations, and culture. Students not only need to know how to

get into college but also how to navigate different resources to be a successful student. For example, students need to know how to use online databases to search for library resources, what offices they need to contact for various services (academic counseling, health services, etc.), and culturally appropriate classroom behaviors. Mentoring, seminars, and campus visits are helpful in socializing students into the college environment. Technology can also be designed to provide socialization. College preparation programs can leverage the popularity of video games to simulate a college campus. Students may choose a character and move it through a series of tasks that identify common student issues, available services, and how to access those services.

Video is another format to disseminate information about college. Digital music players, popular on college campuses, allow students to download music to portable devices. On many college campuses across the nation, students commonly walk around with iPods, the Apple version of the digital music players. iPods, as well as other devices, are beginning to develop streaming video that can also be downloaded and portably watched. College preparation programs can use these devices to create short videos that offer advice on college services. Students would have information readily available to resolve issues quickly. These same digital music (and video) devices can also serve as recorders allowing students to record lectures to listen to before exams. Leveraging products attractive to students is a strategy that works with the current technologies that students use most often.

### *Social Support.*

One of the methods that is commonly used in college preparation programs is peer and adult mentoring. Typically, mentoring is conducted in-person. The creation of a

mentoring relationship relies on individuals being in the same geographic area.

Technology has the potential to assist in creating mentoring relationships that cover vast geographic distances. The use of technology may become particularly important for students who are interested in specific academic fields that are highly specialized and who have a difficult time locating mentors. Email and instant messenger both facilitate positive and productive mentoring relationships (Burgstahler & Cronheim, 2001). Other forms of media that can be used in mentoring relationships include internet chat rooms that are similar to instant messenger, web logs that allow mentors and mentees to post messages, and networking sites that combine many forms of media in one central location.

Many pre-college and college students who have access to computers use popular internet-mediated networking web sites. Common sites include Friendster, Facebook, and My Space. Each of these sites provide students with a web page that describes their interests, a personal web log, and options to connect to other individual who use the same service. Large networks develop, and students regularly communicate with others. College preparation programs can leverage the use of these sites and their networks to promote college going. Instructing pre-college students to network with college students attending those schools in which they are interested would help them to create a college network. This same network can also be helpful once a student enters a college. These sites may also be used to develop a network related to a specific college preparation program thereby allowing students to share resources and create peer-mentoring relationships.

Many of the networking web sites also academically connect students. Face book, for example, allows users to connect to specific courses at their university and link to all other students in the same course. Students are able to meet others, make announcements, and suggest study sessions. In addition, students are also able to share classrooms notes and ask questions about course content. Instructors may also sign-up on Face book and use the network to make course announcements and offer assistance to students. College preparation programs can develop a similar web site that links students across vast distances and who are in similar courses in secondary school. Students can share information and help each other with assignments and difficult concepts. College preparation programs can also use these sites to announce important events and dates, distribute information on college going, and provide tutors who are available via web sites. Many students already use this technology to get extra assistance while in college. Exposing students to new resources before college will help them to integrate in the academic and social networks of college and university campuses.

#### *Family Education and Support.*

An important aspect of many college preparation programs is a focus on educating families to assist student with the college-going process. Low-income students often come from families who lack the social and cultural capital to understand the processes, requirements, and resources required to attend college. Technology has the potential to enhance and supplement in the preparation for college applications, financial aid forms, and college knowledge. It also can help families to maintain close ties once their children go to college. As mentioned above, videos on financial aid is a potential resource for families once they begin the financial aid process. Other uses of technology

for families include: virtual tours of college campuses to assist families in visualizing the college experience, internet chat rooms with other parents and education professionals to answer questions, online-based courses that provide information on the importance of college going, and access to other parents who can serve as mentors and support networks.

An often-overlooked aspect of the college-going process for many low-income families is the difficulty of leaving the household to attend college. Cultural standards may dictate that children do not move out of the house until adulthood or marriage. To facilitate and assist with these emotional challenges, computer-mediated devices could be used to increase contact between students and their families. For example, video conferencing, email, instant messenger, and chat rooms are available to create additional opportunities to communicate over geographic distances. More and variable communication may be helpful in easing the transition and appeasing the concerns of parents and families who are experiencing for the first time as child leaving the home.

#### Considerations in Designing a Technology Enhanced College Preparation Program

When considering adopting technology in an instructional environment or for instructional purposes, an institution should keep several issues in mind. We offer five considerations for the use of technology.

*Technology is expensive and takes time.*

Developing instructional technology is an expensive and time-consuming endeavor. First, instructors need to evaluate curricula and identify the media that will best facilitate increased student learning. Instructors also need to be trained in how to use the

technology. Second, school and program administrators are faced with the difficult task of finding funds to purchase the oftentimes-costly hardware and software. Third, the development of technology for use in the classroom and particularly for large-scale distance learning requires program support and staff development.

The cost of developing technologically enhanced curriculum and programming, providing access to computers, and hiring support staff may be too expensive for many college preparation programs. Evaluation of the cost and benefits of technology in reaching students, connecting students to mentors, offering online resources, and instructional technology needs to be analyzed. A college preparation program can also adopt technology on a small scale by adding technology to one aspect of itself. In addition, adopting technology can be weaved into current uses of technology. For example, many pre-college and college students use Facebook, Friendster, and My Space to connect with peers across the country. A simple program that discusses the use of these networking web sites as resources for college is inexpensive and appeals to the current behavior of many students. Networking with students in college and asking questions about the process and experience of college going is a simple method for using these web sites to create peer mentoring relationships. Another media that can be adopted in college preparation programs are video games. However, the development of video games is a time consuming and expensive process. College preparation programs need to consider the value of specific on-campus visits versus a more generic video game.

*Technology requires access.*

Increasingly, the adoption of instructional technology requires computers and internet access. One of the more troubling assumptions is that all students have access to

computers and are able to take advantage of computer-aided instruction. In fact, American society is experiencing a “digital divide” In 1995, the National Telecommunication and Information Agency (NTIA) reported that there were significant gaps in computer access based on ethnicity, geography, and income level. In subsequent studies, NTIA found that Blacks and Latinos are continuing to lag behind Whites in computer ownership and on-line access signaling a growth in the “digital divide.” Fairlie (2005) found that 40.5 percent of Black and 38.1 percent of Latinos have internet access at home compared to 67.3 percent of Whites. Furthermore, access to computers is currently decreasing in schools where most low-income students are populated (Fox, 2005).

Schools, instructors, and college preparation program administrators need to consider whether students will have access to utilize technology fully to enhance learning. Similarly, without access, students may not have the computer skills necessary to use online instruction. Before establishing instructional technology, it is important to evaluate computer access and consider how to facilitate it. Administrators may consider asking questions about the usefulness of instructional technology and the cost of providing computer access. Access is especially important for those college preparation programs that target low-income students who are often in schools and communities with little to no access to computers. However, a lack of access also signals a need for computer literacy in students who are entering higher education and may not have this required skill. Providing computers to students, schools, and communities may be crucial for student success in universities.

*Cultural differences and learning styles.*

Clark (2001) suggests that technology is initially developed to overcome barriers and is used to create generalizable solutions. Yet, these solutions do not take into account individual differences. Clark (2001) notes that a colorful and diverse visual display may promote learning for one student but not for another. Little is known as to who learns best from multimedia (Mayer, 2001). A few studies suggest that multimedia presentation work better for students with high spatial abilities than for lower level learners (Mayer). When developing technology for students, it is important to consider cultural difference and individual learning styles. For example, implementing a web-based financial aid form to assist students and parents with the complex financial aid process may be a useful tool. For many parents, an understanding of the English language may be limited. Therefore, a financial aid tool could have multiple language settings. Simply, technology may not be the “one size fits all” solution to instruction.

Noting cultural specificity is especially important for college preparation programs that are addressing students of color who may not have exposure and support from others who have gone to college. Designing technologies for instructional or non-instructional purposes needs to take into account a cultural understanding of academic achievement, college, and stereotypes of the college process. Similarly, it is important to consider gender differences in learning styles, access to and interest in technology, and the significance of promoting women in technology related fields. Young women continue to be underrepresented in science, technology, engineering, and math fields that rely heavily on technologies. Finally, the use of technology assumes that individuals have some knowledge and access to computers. Evaluating student knowledge and access is a precursor to designing and integrating technology into college-going programs.

*Technology must be purposeful.*

Scholars consistently suggest that technology needs to be chosen in alignment with curricula. In fact, it is suggested that technology be chosen after the development of curricula to facilitate integrating technology into an established curriculum. This prevents using technology purposefully and in a manner that compliments curriculum. In addition, many students benefit from contact with instructors. In a study of students in a distance-learning course, those students with higher levels of faculty interaction reported the highest levels of value for the course (Fredrickson, Pickett, Shea, Pelz, & Swan, 2000). It is possible that students try to overcome the lack of faculty interaction by being more self-assertive (Clark, 1999). Student may want to have more contact with faculty but find the web-based course more accessible. This is an important finding for college preparation programs that are engaging students either primarily or fully online. Contact with program staff, mentors, and instructor in-person is an important component and should be integrated. Those college preparation programs that attempt to use technology to reach students over vast distances should also consider the importance of in-person interaction.

For those programs and courses that are fully online there are several suggestions to promote student learning and engagement. Distance learning instructors are encouraged to motivate students by appealing to their interests, career or personal goals, and cost issues (Clark, 1999). Individuals values combined with a sense of self-efficacy exert influence over decisions to engage and persist in learning activities (Eccles & Wigfield, 2002; Kanfer & McCombs, 2000; Higgins, 2000). Finally, the personality and attitude of the instructor is an important factor in promoting motivation among distance

learning students. Enthusiastic and accessible instructors serve as good motivators and are more likely to increase self-efficacy.

Not only do these suggestions impact college preparation programs that address academic instructors, they are also important for other forms of programming. College-going programs need to consider methods to appeal to student interests, the personality of the instructor, and the technology self-efficacy of the targeted student population. Using technology can be a self-motivating experience that requires students to log on to a computer and access instructional materials online. Without proper motivation, appeal to interest, and self-efficacy, students may ignore the instructional tools altogether. Without students accessing the resources, college preparation programs will not be successful. Therefore, online computer-mediated communication mentoring should also appeal to students' intrinsic interests by carefully creating mutually beneficial mentor and mentee relationships. Using webs sites, such as Facebook and My Space, and products such as iPods that students are interested in and motivated to use appeals to self-interest. College preparation programs should consider programming that utilizes technologies that students regularly use.

*Structure and media does matter.*

The decision to use multimedia (computers, videos, presentations slides, etc.) may seem to have immediate educational and organizational benefits. Slides, for example, provide a visual representation of material and are also an easy method for students to take notes. However, the way in which multimedia is structured has an impact on student learning. Clark (1999) found that instructional technologies that are crowded oftentimes become overwhelming to the student and reduce mental effort. Other studies note that

presentations with text and audio produce less cognitive load than presentations with text alone (Brünken, Steinbacher, Plass, & Leutner, 2002). Each of these studies suggest that instructors should be purposeful in what images they select in learning based presentations and should supplement the images and text with narrative.

Mayer suggests several additional techniques for developing effective multimedia presentations to enhance student learning. First, multimedia presentations require both words and pictures. Second, the words and pictures should be presented simultaneously. Third, the presentation, such as a slide, should only have words and pictures that pertain to the concept under discussion. Extraneous words and pictures are distracting. Fourth, words need to be spoken and not just presented as text. Fifth, there needs to be an organization to the presentation that examines a cause-and-effect relationship. Each of these techniques have been empirically tested and found to increase the effectiveness of multimedia usage in an instructional setting. Importantly, these technologies illustrate that multimedia is not successful without consideration of how to use media and what media is most effective given the curricula.

Each of these suggestions for designing instructional technology can be used both in instructional design and in media that promotes learning associated with college going. In academic instruction these suggestions can assist in creating templates in after school tutoring and preparation for College Board exams. In addition, Mayer's (2001) suggestions are also helpful in designing videos, websites, and other references for both parents and students to promote their understanding of specific procedures, such as completing application forms and financial aid documents. These forms are often difficult

for parents who did not attend college. In any scenario, the structure in addition to the content needs to be considered and designed for maximum learning benefits.

Currently, there are no published studies that examine how and why course instructors choose certain forms of media (Clark, Bewley, & O'Neil, 2005). However, research consistently suggests that media should be chosen after the curricular design of a course. This enables the instructor to choose a form of media that compliments the curriculum rather than designing curriculum around the media. Clark, Bewley, and O'Neil (2005) suggest four steps when choosing media for instruction: (1) review if the media platforms can simulate cause-and-effect; (2) offer live opportunities for students to conduct simulations and receive corrective feedback; (3) provide all the necessary sensory (visual, auditory, etc.) information required; and (4) be cost effective. Sugrue and Clark (2000) suggest similar techniques for designing training programs.

College preparation programs, as they consider using technology, should also begin with a set of goals and objectives for the overall program before they consider adopting technology and specific forms of medium. For example, email and instant messenger have been found to assist in peer and adult mentoring. Adopting these forms of media seems realistic but adult mentoring also benefits from in-person contact. College preparation programs must consider all the costs and benefits of adopting technology and specific media.

## Conclusion

The proliferation of computer technology has changed how instruction is conducted and individuals network and increased the availability of resources.

Technology is a common part of college classrooms and has altered the ways in which students interact. The adoption of technology for instructional and social purposes varies widely and ranges from a fully in-class format to a distance learning one. College preparation programs aimed to increase college going and to aid in the transition to a higher education setting could benefit from the use of widely adopted and emerging technologies. Programs would better prepare students for college by providing access and exposure to technology, as well as instruction. Technology's benefits in college preparation aside, there are several issues to consider. College preparation programs would be remiss if they did not consider the cultural specificity, design, expense, and benefits before adopting various media technologies. The adoption of technology to aid in college going has the potential to help students succeed both academically and socially, but should be carefully considered and purposefully implemented.

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