FACTORS THAT INFLUENCE
DISSEMINATION AND ADOPTION OF A
WEB-BASED HEALTH EDUCATION CURRICULUM

by

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A thesis submitted to the
University of Colorado at Denver
in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
Health and Behavioral Sciences
2005
This thesis for the Doctor of Philosophy degree by Walter F. Young has been approved by Erv Bettaglia, Corbett, Mark Bixler, and Rod Muth.
ABSTRACT

The goals of this research project were to describe the factors associated with adoption of the Consider This middle school tobacco education curriculum and to characterize the diffusion process for this Internet-based health education curriculum.

The specific aims of this study were to:

1) Describe the Diffusion of Innovations characteristics (relative advantage, compatibility, etc.) that contributed to adoption of the CT curriculum;

2) Identify the PRECEDE model factors (predisposing, enabling and reinforcing factors) associated with adoption of CT; and

3) Describe emergent and non-theoretically-based factors that influenced adoption of CT.

The research question answered in this study was, "Is the extent to which teachers identify individual adoptive behaviors or characteristics, environmental factors conducive to adoption, and CT characteristics associated with the DOI and PRECEDE models associated with adoption of the CT curriculum?"

This follow-up study used quantitative and qualitative methods to gather information from Colorado educators who were trained to use CT in 2002. All educators who were trained (n=147) were mailed a questionnaire that assessed the factors that associated with dissemination and adoption of the curriculum. The returned questionnaires (n=87) also identified study participants and their personal contact information who were willing to be interviewed by the investigator (n=27).

Twenty-three face-to-face and telephone interviews with educators from around the state of Colorado helped enrich the data that was collected via the survey. Interviews were recorded on audio tape and transcripts entered into a text analysis software package to facilitate coding and analysis of data.
Some of the factors shown to positively influence dissemination of this curriculum included: computer availability and accessibility; teacher knowledge of and skill with computer technology; teacher access to peer networks; teacher motivation / determination; and information technology support. Some of the barriers to diffusion and adoption included: attrition (turnover) of teachers; discontinued training program for CT; too few computers; poor access to the computers in schools (scheduling and restricted use); apathy toward classroom change; and frustration with and lack of IT support on technical problems.

This abstract accurately represents the content of the candidate’s thesis. I recommend its publication.

Signed: Kitty Corbett
DEDICATION

This research is dedicated to my family that has so patiently tolerated my weekend absences over the past year and especially to my wife Susan whose encouragement kept me working when times were tough. This is also dedicated to my parents Florence Young and the late, Walter J. Young, who always encouraged and supported continued education.
ACKNOWLEDGEMENTS

The author would like to thank the many health education teachers, school nurses, counselors and administrators who responded to my survey and who agreed to be interviewed for this research. I would also like to thank Dr. Kitty Corbett for her guidance throughout the planning, conduct and writing of this dissertation and to my dissertation committee members who read and edited earlier versions of this work.

A special thanks goes to Dr. David Buller, Vice President, Health Communications Division of the Cooper Institute for his support, patience and tolerance of an employee who was often preoccupied with his dissertation work.
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CHAPTER 1

INTRODUCTION

“Despite the fact that the number of computers in teachers’ classrooms has increased dramatically in the last 20 years, researchers and educators alike report that integrating technology into the classroom curricula is not easily accomplished.” (Ertmer, Addison, Lane, Ross, & Woods, 1999)

Computer-based curricula, if adopted broadly by teachers for classroom use, have great promise for enhancing educational outcomes. Computer-related tools, when used regularly in the classroom, have been shown to have positive effects on student cognitive and attitudinal outcomes (Cotton, 1997; Godfrey, 2001; Handel, 1997; Newhouse, 1998). However, dissemination of computer-based curricula into classrooms is a challenge, and not well understood. Research-based dissemination strategies are needed to overcome teacher-related and system or structural barriers to use of computers and computer-based curricula in the classroom. Better understanding of barriers to the adoption and use of computer-based curricula should contribute to greater success in teaching that employs new technologies. Understanding of the factors that promote and inhibit dissemination and ultimately adoption of web-based curricula should inform the design of effective dissemination strategies. This project draws on theoretical approaches that have been useful for understanding how technological innovations are diffused (Rogers’
Diffusion of Innovations theory, referred to as DOI) and how projects are planned and implemented (PRECEDE-PROCEED Model). This project employs constructs from these theories to determine the processes and factors that influenced the dissemination and adoption of a web-based tobacco education curriculum, Consider This (CT), that was designed for middle school students in Colorado.

Internet-based curricula will likely play an increasingly significant role in health education for school children in the next decade. Computer-based instructional tools hold great potential to provide health information and influence health behavior. Cancer, heart disease and diabetes are among the leading causes of death in the United States and each of these diseases has behavioral risk factors that can be influenced through education and behavioral interventions (CDC, 2000). As computer technology advances and new online instructional software are developed and disseminated, schools will have an increasing opportunity to adopt Internet-based educational curricula that have potential to influence health behaviors. The rate and extent of the diffusion of these technology-based innovations depend on numerous and complex individual and environmental factors. Understanding these factors and their influence on dissemination and adoption processes will help advance the efficacy of Internet instructional technology.

This project draws on theory to elucidate successes and failures with the dissemination and adoption of a web-based tobacco education curriculum, Consider This (CT), for middle school students. The goals of this research project were to describe factors associated with dissemination and adoption of CT, an online tobacco prevention program, and to characterize the diffusion process for this Internet-based health education curriculum.
Specific Aims and Hypotheses

The specific aims of this study were to:

1) Describe the DOI characteristics (relative advantage, compatibility, etc.) that contributed to adoption of the CT curriculum;

2) Identify the PRECEDE factors (predisposing, enabling and reinforcing factors) associated with adoption of CT; and

3) Describe emergent factors that influenced adoption of CT.

Identifying the factors and processes associated with adoption and use of CT will help inform educators and school policymakers how to better plan, develop, and/or adopt Internet-based health education curriculum.

This study answered the following research question: What is the relevance of teacher characteristics (i.e., knowledge, attitudes, and experiences related to adopting the curriculum) and school environments (i.e., hardware environment, staffing factors), to adoption of an online health curriculum? Study hypotheses proposed that teachers who adopt CT are more likely:

- to self-identify as early adopters of technological innovations;
- to have heard about CT through social networks;
- to have registered for the training seminars because of the incentive factors offered;
- to have greater comfort level with computer technology;
- to have had formal training in use of computers or Internet;
- to have received his or her undergraduate degree later;
- to have an advanced degree;
- to be younger;
• to have received more formal training in use of computers or the Internet;
• to be nonsmokers;
• to participate in social systems that demonstrate leadership in their school
  or profession.

Background

An education futurist envisioned that technology was empowering an
evolution in educational infrastructure for learning and that advanced information
technology was essential to success (Dede, 1990). At the time of this publication
computer technology was a part of teacher activity, from the most remote rural
schools to schools in the inner city. This paper reported that teachers used computers
to prepare lessons, record grades, create handouts, and communicate with each other,
school administrators, and parents. But do they use computers in the classroom? If
computers are not used, why not? If they are used, what factors facilitated use?

Less than 10% of faculty at Stanford University were using computer
technology in the classroom in 1999 (Cuban, 1999). While classroom utilization
may have improved since the Stanford report, use of technology in the classroom
depends on the teachers’ ability to integrate it (Dalton, 1989; Kent & McNerney,
1999), material factors (e.g., scarcity of equipment), and social factors. Dalton also
determined that when teachers lack confidence to integrate technology, they ignore
it. A review of existing studies on teacher attitudes disclosed that a teacher’s own
confidence level in their ability to use computer technology had a strong effect on
its use (Hardy, 1998). In 1999, only 10% of public school teachers reported feeling
“very well prepared,” and 23% reported feeling “well prepared” to use computers
or the Internet for instruction. The majority (53%) reported feeling "somewhat prepared," and 13% reported feeling "not at all prepared" (USDOE, 1999).

While there appears to be support for use of computers in the classroom, not all educators agree. At least one author contends that there is early and excessive concern about "computer literacy," too often at the cost of basic literacy and that schools systems are unable to maintain equipment or train teachers once the hardware is in place (Oppenheimer, 2003). He contends that "computer infatuation has not only drained billions of dollars from more urgent educational needs, but that its misuse actually damages students, turning out a generation of kids with inferior learning and thinking skills" (Newsweek, 2003). Despite his contentions, computer technology has become an important educational resource in schools and it will not likely become less so. Therefore, identifying ways to more effectively use this educational resource remains an important effort.

The Internet-based curriculum on which this investigation focuses is

*Consider This (CT)*, a tobacco use prevention and cessation curriculum designed for middle-school students (grades 6 through 9) by researchers at the Center for Health Communications of The Cooper Institute, Denver office.

CT is an online curriculum (http://www.considerthisusa.net) that employs interactive Web technology with high-quality audio and video features that actively engage students in lessons about tobacco use and its health effects. It tailors information and provides individualized feedback based on the knowledge, attitudes, behaviors and behavioral intentions of student users. A downloadable teacher’s manual is available. The curriculum aims to influence attitudes and behaviors about tobacco use through an interactive multimedia smoking prevention and cessation program. CT was offered to all Colorado schools in the fall of 2001.
The Douglas County School District (DCSD) in Colorado was initially selected as the sole site for this investigation. However, after eight interviews with DCSD employees and multiple attempts to contact middle-school principals it became apparent that DCSD would not provide sufficient participants from whom to gather information. The study was expanded to include all teachers and administrators who were trained in late 2001 and early 2002 to use CT.

Figure 1.1 illustrates the process and timing of this study. The narrative that follows describes each step of the process.

During the school year 2001-2002, with funding from the Colorado Department of Public Health and Environment, I directed a project that offered the CT program to all Colorado schools with middle school aged students (ages 12-14). As part of this offering, training seminars were made available to all middle-school health teachers, school nurses, counselors, principals, school district administrators, and both district-level and school-level information technology staff.

Promotional materials (posters and brochures), were designed, printed and distributed to all public and private schools in Colorado for the dissemination phase. Packets of promotional materials describing the Consider This program and inviting them to attend a training seminar in their area were mailed to all school district administrators, principals, Safe and Drug-free education coordinators1, and Colorado Department of Education (CDE) health education contacts who work with students grades 6-9. Seminars were offered free-of-charge in each of the eight CDE Regional Service Areas during the 2001-02 school year. Interested persons called project offices on a toll-free number to register or registered online.
Figure 1.1: Process of Quantitative and Qualitative Study on Dissemination of *Consider This*, an Internet-Based Tobacco Education Curriculum.

**Development of Consider This**  
1998-2000

**Innovation Dissemination**  
Fall 2001

**Teacher Training on Consider This**  
Winter 2001-2002

**Classroom Implementation**  
2001-2003

**Study Initiation**  
Spring 2003

**Wave I: DCSD Interviews (n=8)**  
February-March 2003

**Survey of Teacher Trainees (n=147)**  
April-May 2003

**Wave II: Non-DCSD Teacher Interviews**  
July-August 2003

**Analysis and Writing**  
Survey and Interview Data  
October 2003-June 2004
A total of 147 school personnel were trained during the months of November 2001 through January 2002. At these one-day, all-expense-paid training sessions, school personnel learned how to implement the CT program. Teachers were shown how the CT program fits within the Center for Disease Control's *Best Practices for Comprehensive Tobacco Control* (USDHHS, 1999) and the state of Colorado's tobacco control objectives. They learned the tobacco prevention principles that form the scientific basis of the online activities included in the CT program. Each feature and educational module of the Internet-based program was introduced, reviewed, and demonstrated, with special emphasis on those features that ensured confidentiality of student responses. Teachers learned the administrative tools in the CT program that enabled them to help students enroll and use it. They were informed about telephone and email technical assistance services provided by the CT project staff, and received a teacher's manual containing information designed to support successful implementation of the program in their classrooms.

Wave I of the interviews conducted for this study occurred in the Douglas County School District (DCSD) because an administrator there was particularly interested in using this curriculum and strongly encouraged the initiation of the program. Ten DCSD teachers, two administrators, and one information technology staff person attended one of the eight training seminars. The Wave I interviews informed development of the questionnaire that was used in the survey of all trainees. The survey identified additional interview participants from throughout the state of Colorado for a total of 23 interviews. (Study process details are described in Chapters 3 and 4.)
Despite the availability of this free program and the no-cost training to facilitate implementation, not all school districts were represented at the training seminars and not all of those who were trained ended up implementing the curriculum in their classrooms. Investigating the reasons for this variable use of CT will help inform future dissemination efforts related to Internet-based school health curricula. This investigation used two theories to structure the inquiry: 1) Diffusion of Innovations and 2) PRECEDE / PROCEED. Diffusion of Innovations offers a theoretical framework that explains "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1995, p. 10). PRECEDE theoretical constructs (predisposing, reinforcing and enabling factors) are based on the premise that diagnosis of an educational problem precedes an intervention plan and that there are specific predisposing, enabling and reinforcing factors that contribute to the accomplishment of that plan (Green and Krueter, 1991). Because this investigation was limited to the process stages that led to teacher adoption and use of CT in the classroom, constructs of the PROCEED stage of this theory (Implementation and Evaluation) were not used here. (Process, impact and outcome measures are currently under investigation in a separate study being conducted by investigators at The Cooper Institute, Denver office.)

In summary, the outcomes of this investigation were achieved through a research design that combined elements of the Diffusion of Innovations (DOI) theory, a theory central to communications research, and elements of a public health community (environmental) behavior change planning model, PRECEDE. The DOI model focuses primarily on innovation characteristics and social system processes,
while PRECEDE is more ecologically or social systems focused. PRECEDE was designed to assess social system factors that influence public health outcomes for more effective health planning. For this investigation, combining these two models provides a broader perspective on the adoption characteristics than either could have provided alone.

Overview of Research Design and Methods

Quantitative and qualitative methods were used to achieve the specific aims of this investigation. A non-probability, purposive sample was used for the survey research (Backstrom CH, Hursh-Cesar G, 1981). The population surveyed was the population of educators who attended one of the eight CT training seminars provided in Colorado during the school year 2001-2002. A structured questionnaire was developed and mailed to each training seminar attendee. Specifically, survey questionnaires were mailed to 147 teachers, administrators, counselors, school nurses, school information technology staff, and public health agency tobacco control staff who attended a CT training seminar. Of the 87 returned surveys, 24 respondents consented to be interviewed.

In-depth, semi-structured interviews were conducted using open-ended questions with the 24 participants who consented to be interviewed. Purposive sampling allowed me to interpret or test the DOI and PRECEDE theories.

Quantitative and qualitative results of this multi-method investigation were combined for an enriched understanding of the factors that influenced dissemination and adoption of CT.
CHAPTER 2

TECHNOLOGY IN EDUCATION AND YOUTH TOBACCO USE

This chapter reviews the literature on diffusion of technology in education, tobacco use among youth, health effects and risks of tobacco use, prevalence of youth tobacco use, incidence of initiation, school-based tobacco prevention programs, diffusion of technology in education, Internet use among youth, computers and Internet access in Colorado schools.

The literature in this area of research focuses on factors that impede or promote adoption of computer technology in the classroom. Since these factors can be categorized using many theoretical approaches, this literature review identified and collapsed them into 5 groups: factors in the individual domain; factors in the organizational domain; material factors; perceived attributes of the innovation; and social factors. While an effort was made to segregate and label these factors into the above groups, many of the factors identified did not fit into a single category and were labeled accordingly.

The predominant diffusion model referenced by the research discussed here was Rogers’ Diffusion of Innovations (1995). In general, the authors of the papers reviewed here based much of their work on the DOI model. It was also apparent from this review that the study of diffusion of computer-based technology in education is still quite young and therefore rich in diverse opinions and perspectives.
Factors Associated with Diffusion of Computer-Based Educational Technology

An extensive literature review identified the following factors that prevent teachers from using technology (Mumtaz, 2000).

- Lack of teaching experience with information and communications technology (ICT) (individual factor);
- Lack of onsite support for teachers using technology (organizational factor);
- Lack of help supervising children when using computers (organizational factor);
- Lack of ICT specialist teachers to teach students computer skills (individual / organizational factor);
- Lack of computer availability (material factor);
- Lack of time required to successfully integrate technology into the curriculum (individual / organizational factor); and
- Lack of financial support (organizational factor).

Mumtaz’s review identified factors in four of the five groups discussed in this review.

Three styles of computer use among teachers were identified as: avoidance, integration and technical specialization (Evans-Andris, 1995). Avoidance was reported as the dominant style of computer use in this study. Those teachers distanced themselves from computers and reduced the amount of time they spent attending to computer related activities. Those teachers who engaged in “integration” embraced computers, integrating them into their teaching methods and curriculum.
The "technical specialization" teachers embraced computers and promoted their use in school, but also viewed them as a challenge.

Teachers' resistance to computer use was divided into several broad-based themes (Robertson, Calder, Fung, Jones, O'Shea, & Lambrechts, 1996). Those themes were:

- Resistance to organizational change (individual / organizational factor);
- Resistance to outside intervention (individual factor);
- Time management problems (individual / organizational factor);
- Lack of support from administration (organizational factor);
- Teacher's perceptions (perceived innovation attributes); and
- Personal and psychological factors (individual factor).

Social factors that influence diffusion of technology in the classroom must be incorporated in the instructional development process (Scurry and Farquhar, 1996). After a discussion of social factors identified by Rogers (1995), the authors reviewed a model developed by Stockdill and Morehouse (1992). This model identifies five categories of social factors that influence innovation diffusion: 1) educational need (social and organizational factors); 2) user characteristics (individual factors); 3) content characteristics (perceived attributes of the innovation); 4) technology considerations (materials factors); and 5) organizational capacity (organizational factors). Scurry and Farquhar concluded with recommendations that they hope will advance the evolution of technology-based instructional development. These recommendations were:

- Instructional developers should consider adoption and diffusion as strongly as they consider instructional effectiveness (social factors).
• Instructional developers should understand that adoption is the result of purposeful planning and does not automatically follow the development of instructional or technically superior products (organization and individual factors).

• Instructional designers should modify their design and development models to incorporate tools discussed in their paper. (Two of these tools are: *Environmental Analysis*—a process that identifies the physical environment and support system factors in place at the adoption site(s) and *Adoption Analysis*—a process that identifies key factors likely to influence the adoption of their product.)

Scurry and Farquhar concluded that social factors must be incorporated into the instructional development process in order to increase adoption.

In a review of the literature on the impact of computer based technologies in schools Lal (2002) identified the following factors that influenced technology uptake and integration in the classroom. Those factors were: ease of Internet access (material factor); involvement of the whole school community (social factor); support of the school principal and commitment of teachers to professional development in the technology area (individual / organizational factor); collaborative professional development projects and staged implementations (social factors); rallying schools around a technology goal (organizational factor), and; a good interpersonal relationship between the teacher and the technology administrator (social factor).
Table 2.1: Conditions that Facilitate Implementation of Educational Technology Innovations

<table>
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<tr>
<th>Condition</th>
<th>Description</th>
<th>Linked to...</th>
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<tr>
<td>Dissatisfaction with the status quo (individual/organizational factor)</td>
<td>Feeling a need to change</td>
<td>Leadership</td>
</tr>
<tr>
<td>Expertise (individual factor)</td>
<td>Access to the knowledge and skills required by the user</td>
<td>Resources, rewards &amp; incentives, leadership and commitment</td>
</tr>
<tr>
<td>Resources (organizational factor)</td>
<td>Things needed to make it work – funding, hardware software, tech support, infrastructure, etc.</td>
<td>Commitment, leadership, rewards &amp; incentives</td>
</tr>
<tr>
<td>Time (individual/organizational factor)</td>
<td>Prioritize allocation of time to make it work</td>
<td>Participation, commitment, leadership, rewards &amp; incentives</td>
</tr>
<tr>
<td>Rewards and incentives (organizational factor)</td>
<td>Internal and external motivators preceding and following adoption</td>
<td>Participation, resources, time and dissatisfaction with status quo</td>
</tr>
<tr>
<td>Participation (individual/social factor)</td>
<td>Shared decision-making; full communication; good representation of interests</td>
<td>Time, expertise, rewards &amp; incentives</td>
</tr>
<tr>
<td>Commitment (organizational factor)</td>
<td>Firm and visible evidence of continuing endorsement and support</td>
<td>Leadership, time, resources and rewards &amp; incentives</td>
</tr>
<tr>
<td>Leadership (individual/organizational factor)</td>
<td>Competent supportive leaders of project and larger organization</td>
<td>Participation, commitment, time resources, and rewards &amp; incentives</td>
</tr>
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</table>

In a review of conditions that facilitated the implementation of educational technology innovations Wilson et al. developed the above table (Table 2.1) to summarize their findings. (The parenthetical phrases in the conditions column are the investigator’s categorization of the facilitating conditions.)

The Wilson et al. article was a departure from other articles reviewed in that it cited features common to failed innovations. The factors that they cited were:
• Practitioners become disenchanted and disillusioned because the innovation is more difficult than expected, causing too much disruption and taking too much time. (perceived innovation attribute factor)
• Innovation supporters leave or are not available. (individual/social/organizational factor)
• People lack training and lose enthusiasm. (individual factor)
• Funding runs out. (organizational factor)
• There is inadequate supervision and support from management. (organizational factor)
• The program lacks accountability. (organizational factor)
• There is a “take-it-or-leave-it” attitude on behalf of the promoters. (social/organizational factor)

This article was important to this investigation in that it documented some factors on the negative side to the diffusion of innovations equation, in an effort to remind practitioners to learn from the mistakes of others. This approach to learning has been largely neglected in the literature, and therefore motivated me to identify barriers to diffusion in this investigation.

A simple model of diffusion, Concerns Theory, was reviewed by Dooley (1999). This stage-based theory was developed by Hall and Hord (1987), and is based exclusively on the concerns of the user as they unfold in the change process. Its basic premise of this theory is that change is a process not an event. The authors contend change should be examined by the various motivations, perceptions, attitudes, and feelings experienced by the individual.
At the beginning of the change process the typical non-user has concerns that are relatively high regarding Awareness, Information and Personal (self concerns). These non- or low-users are concerned about gaining information about the innovation and how it will affect them. As new users become more comfortable with the new technology they develop more concerns about the management of the innovation (task concerns). These two concerns decrease in intensity as the user becomes more skilled with use of the innovation and the impact concerns (Consequence, Collaboration, Refocusing) become more intense.

Dooley loosely associates this model to Rogers’ stages in the innovation-decision process. Figure 2.1 below illustrates how these models compare.

Figure 2.1: Stages of Concerns-Based and Diffusion of Innovations Models

Concerns-Based Adoption Model

Self concerns → Task concerns → Impact concerns

Stages in the Innovation-Decision Process

Knowledge → Persuasion → Decision → Implementation → Confirmation

There is a school of thought that contends that the primary reason for low-uptake of computer technology in the classroom is related to the lack of supporting knowledge, beliefs and attitudes about computers among teachers. The concept of
barriers to implementation pre-dominates this school of thought. Handal (2001) cites a quotation that captures this paradigm, “The knowledge, attitudes and beliefs that teachers have... shape what they choose to do in their classrooms and explain the core instructional practices that have endured over time” (Cuban, 1993, p. 256).

While the DOI model is a conceptual focus of this dissertation, findings that encourage teachers to use technology will also be discussed in Chapters 4 and 5 using constructs from the PRECEDE model. The following literature review lends support to the use of the PRECEDE model when categorizing factors associated with teacher use of computer technology. While not categorized using PRECEDE constructs, the following studies identified factors that “encourage” use. All of these findings could be categorized using these PRECEDE constructs.

One study of 72 computer using teachers with a mean age of 42 years found that it was most important to their personal work and to their teaching and that they planned to extend their use of computers in the future (Cox, Presto & Cox, 1999). This study further found the following factors to be most important to sustained use in teaching: making lessons more interesting; easier; more fun for them (teachers) and their pupils; more diverse; more motivating for the pupils and more enjoyable.

A second study of four teachers from a Dutch secondary school who were observed and interviewed, disclosed a few significant findings (Veen, 1993). First, while school factors (principal support, 20 hours per week of IT support) played an important role in how these teachers used their computers, personal factors outweighed the school factors. These teacher-level or personal factors were divided into beliefs and skills. The beliefs included: teachers’ beliefs about what should be in the curricula (content); and the way in which subjects should be taught. The
skills that influenced their use of computers included: skills related to a teachers’ competence in managing classroom activities (enabling factor); pedagogical skills (enabling factor); and to a lesser degree, computer-handling technical skills (enabling factor). The most important finding from this study was that if the software matched the teachers’ pedagogy (reinforcing factor) they used it. The outcomes of this study must however, be viewed with some reservation, since it was conducted with a very small sample and in an artificially constructed research environment, where 20 hours per week of IT support was provided in a single school to four teachers.

Several studies used survey methods to identify factors that teachers integrated computers into their teaching practices (Mumtaz, 2000). One nationwide study of fourth through twelve grade teachers conducted in the United States found three factors associated with “accomplished” teachers who integrated computers in their teaching (Sheinhold and Hadley, 1990). These factors were:

- teacher motivation and commitment to their students’ learning and to their own development as teachers (predisposing factor);
- the support they experienced in their schools (predisposing factor); and
- access to sufficient quantities of technology (enabling factor).

These teachers also worked in schools where hardware and access to resources were twice the average (enabling factor), were comfortable with technology (enabling factor) and used computers for many purposes (predisposing, enabling and reinforcing factor).

A more recent study in constructivist classrooms on professional engagement and teaching practice, including computer use, found that teachers who regularly engage in professional interactions and activities beyond the classroom teach in
different ways than teachers who have minimal contact with their peers (Becker & Riel, 2000). (Constructivist classrooms are where students are guided to teach themselves by gathering information and making their own observations and conclusions. The constructivist teacher sets up problems and monitors student exploration, guides the direction of student inquiry and promotes new patterns of thinking (SEDL, 2004)). The more that teachers were involved with professional activities (informal interaction with peers, workshops, leadership activities, mentoring, presentations at conferences), the more likely they were to use computers in exemplary ways. This finding suggests that professional interactions and activities may be predisposing and reinforcing factors for adoption of technology. This finding is also consistent with Rogers (1995) observation that innovators or early adopters tend to be more cosmopolite than laggards.

Applications of PRECEDE Model in Public Health

PRECEDE stands for ‘predisposing, reinforcing, and enabling constructs in educational/ecological diagnosis and evaluation. The model recognizes that institutional and environmental factors influence knowledge uptake and behavior change.

This model appealed to me since it represents a planning process that leads to implementation of changes needed for improvement of health and social conditions. While it was designed expressly for application in the community public health area, it was easily adapted to the school environment. In this study the PRECEDE model was not implemented in a stepwise fashion as the model suggests, but was adapted so it could serve as a tool for planning and implementing change in the
school environment. This model provided a conceptual framework or structure for an evidenced-based investigation into the dissemination and adoption of the CT health education curricula. The core constructs were borrowed for this study since they are likely easily understood by policy makers/school administrators who will be responsible for the application of the findings.

Tobacco Use Among Youth

Tobacco use is the single-greatest cause of preventable death and disability in the United States. Among young people, the short-term health consequences of smoking include respiratory and non-respiratory effects, addiction to nicotine, and the associated risk of other drug use. Long-term health consequences of youth smoking are reinforced by the fact that most young people who smoke regularly continue to smoke throughout adulthood. (USDHHS, 1994)

Tobacco use causes more than 400,000 premature deaths each year in the U.S. (one in every five deaths) and results in an annual cost of more than $50 billion in direct medical costs. This death toll is greater than the number of deaths from AIDS, alcohol, drug abuse, car crashes, murders, suicides, and fires---combined (IOM, 1994, p. 3). The Colorado Department of Public Health and Environment (CDPHE) estimates that with a $15 million annual investment from the tobacco settlement there is the opportunity to save $930 million a year and over 4,000 lives in Colorado (CDPHE, 2001).

Tobacco use most often begins with addiction to nicotine in childhood and adolescence. Each year 20,000 Colorado youth under age 18 become daily smokers. At this rate, 86,000 Colorado youth alive today will die an early preventable death
because of a decision made as a child—the decision to smoke cigarettes. Tobacco caused disease is also associated with use of smokeless or spit tobacco. Colorado has one of the highest rates of spit tobacco use among boys in the country (CDPHE, 2000).

**Health Effects and Risks of Tobacco Use**

Cigarette smokers have a lower level of lung function than those persons who have never smoked. Smoking is particularly deleterious to the health of young people since it reduces the rate of lung growth. Smoking hurts young people’s physical fitness in terms of both performance and endurance—even among young people trained in competitive running.

In adults, cigarette smoking causes heart disease and stroke. Studies have shown that early signs of these diseases can be found in adolescents who smoke (USDHHS, 1994). On average, someone who smokes a pack or more of cigarettes each day lives 7 years less than someone who never smoked (Kuller, Garfinkel, Correa, Haley, Hoffmann, Preston-Martin, 1986).

The Surgeon General’s 1994 report also reported that the resting heart rates of young adult smokers are two to three beats per minute faster than nonsmokers and that smoking at an early age increases the risk of lung cancer. For most smoking-related cancers, the risk for cancer increases as the individual continues to smoke.

Teenage smokers suffer from shortness of breath almost three times as often as teens who don’t smoke, and produce phlegm more than twice as often as teens who don’t smoke (Arday, Giovino, Schulman, Nelson, Mowery, & Samet, 1995). These
researchers also reported that teenage smokers are more likely to have seen a doctor or other health professionals for an emotional or psychological complaint.

Teens who smoke are three times more likely than nonsmokers to use alcohol, eight times more likely to use marijuana, and 22 times more likely to use cocaine. Smoking is also associated with a host of other risky behaviors, such as fighting and engaging in unprotected sex (USDHHS, 2002).

**Prevalence of Youth Tobacco Use**

- 28.5 percent of high school students currently smoke cigarettes, down from 36.4 percent in 1997 and 34.8 percent in 1999. Current smoking is defined as having smoked on one or more days of the 30 days preceding the survey.
- If teen smoking prevalence continues to decline at the current rate, the United States could achieve the 2010 national health objective of reducing current smoking rates among high school students to 16 percent.
- Lifetime cigarette use among high school students is 63.9 percent, down from 70.4 percent in 1999.
- Current frequent smoking, defined as smoking on at least 20 of the 30 days preceding the survey, decreased from 16.8 percent in 1999 to 13.8 percent in 2001.
- In 2001, as in previous years, white and Hispanic students were significantly more likely than black students to report current smoking (USDHHS, 2002).
Incidence of Initiation

The onset of tobacco use occurs primarily in early adolescence, a developmental stage that is several decades removed from the death and disability that are associated with smoking and smokeless tobacco use in adulthood. Currently, very few people begin to use tobacco as adults; almost all first use has occurred by the time people graduate from high school. Ninety percent of smokers started smoking before the age of 19 years and 60% before 16 years of age. The earlier young people begin using tobacco, the more heavily they are likely to use it as adults, and the longer potential time they have to be users. Both the duration and the amount of tobacco use are related to eventual chronic health problems. The processes of nicotine addiction further ensure that many of today’s adolescent smokers will regularly use tobacco when they are adults (USDHHS, 1994).

A retrospective study of regular smokers found that each day an alarming number of young people join the ranks of regular smokers. This study (Substance Abuse and Mental Health Services Administration’s 1994-1997 National Household Surveys on Drug Abuse) estimated that more than 6,000 persons under the age of 18 years try their first cigarette each day. The study also found that more than 3,000 persons under the age of 18 years become daily smokers every day (USDHHS, 1998).

Other findings from this study on uptake or initiation of cigarette smoking are:

- In 1996, more than 1.851 million Americans became daily smokers, of which an estimated 1.226 million (66.2 percent) were under the age of 18 years.
- The number of adolescents who become daily smokers before the age of 18 years increased by 73 percent from 1988 (708,000) to 1996 (1.226

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— rising from nearly 2,000 to more than 3,000 persons under the age of 18 years who become daily smokers each day. If the rate of smoking initiation among young people had held constant since 1988, then 1.492 million fewer persons under the age of 18 years would have become daily smokers by 1996.

- In the 1960s and 1970s, the rate of first-daily smoking was highest for persons aged 18-25 years. Since the late 1980s, however, the rate of first-daily smoking was similar for adolescents aged 12-17 years and young adults aged 18-25 years.

- Among persons aged 12-17 years, the incidence of first use of cigarettes per 1,000 potential new users has been rising continuously during the 1990s and has been steadily higher than for persons aged 18-25 years since the early 1970s.

Figure 2.2 illustrates that, for example, there are only two years between the age that a 16-year old person first tries a cigarette and the age at which daily smoking begins. This figure also illustrates that if a child has not started smoking by the time they graduate from high school (age 18) it is likely he/she will never start smoking. Ten percent or less of those surveyed in this study started smoking after age 19.

A recent Colorado survey of high school students shows that 39.4 percent of Colorado’s sixth- to eighth-graders report having used tobacco products, compared to 33.5 percent nationally; one in four of these students had experimented with cigarettes before the age of 11 (CDPHE, 2001). This is particularly troublesome since, the younger a person is when they first start smoking the higher his or her chance of becoming a regular smoker, the less likely he or she is to quit successfully and the more likely he or she is to contract lung cancer (Khuder, Dayal, & Mutgi, 1999).
Smoking among adolescents is on the rise with an estimated 3,000 youth becoming regular smokers everyday (Gilpin, Choi, Berry & Pierce, 1999). Tobacco use begins in early adolescence with 12 years of age being the average age a child smokes his/her first cigarette. Approximately one-third of these children will eventually die of smoking related illnesses (CDPHE, 2000).

**School-based Tobacco Use Prevention.**

Evidence of the intractable nature of the tobacco use problem in schools was found by the Youth Risk Behavior Survey (NCI, 2001). This assessment found that
during the 30 days that preceded the survey, 14.6 percent of high school students reported smoking on school property.

Much of the responsibility for educating youth about the tobacco problem and providing them with the tools to resist tobacco use has fallen on schools. Consequently, Colorado middle and junior high schools, and schools around the nation, have searched for effective tobacco use prevention curricula and policy strategies that are relevant to their students and can be implemented efficiently. Intervening to prevent tobacco use in these early, formative years is an important strategy to reduce the human and economic toll of tobacco use. “School-based smoking prevention programs based on a model of identifying social influences on smoking and providing skills to resist those influences, have demonstrated consistent and significant reductions in adolescent smoking” (USDHHS, 1994, p. 274). This Surgeon General’s Report goes on to say, “The effectiveness of school-based smoking-prevention programs appears to be enhanced and sustained by comprehensive health education and community-wide programs that involve parents, mass media, community organizations, or other elements of the adolescent’s social environment” (USDHHS, 1994, p.275). Despite these conclusions, implementation of sustained school-based interventions has proven difficult.

Only a few school-based educational efforts have been found to be effective in preventing tobacco use among youth and young adults. Since schools are a focal point for educational efforts to prevent youth tobacco use, these curricula and others in the process of being tested or developed hold promise to reduce tobacco use among young people. Among the few school-based programs that were found to be effective are Project TNT, Life Skills Training, Project Alert, and Not On Tobacco, described below.
Project TNT

Researchers with CDC (Wang, Crosett, Lowry, Sussman & Dent, 2001) concluded that Project TNT (Towards No Tobacco), a classroom intervention, was highly cost-effective compared with other widely accepted preventive interventions, and that school-based prevention programs of this type warranted careful consideration by policy makers and program planners.

Project TNT, a ten-lesson curriculum designed to counteract the social and physical consequences influences of tobacco use, was delivered by trained health educators to 7th-grade students in eight junior high schools. A cohort of 1,234 students participated in the program and was presented with a 2-day booster session in the second year. The effectiveness evaluation was based on a cohort of 770 9th-grade students who participated in this two-year follow-up study. When the uptake rate for the comparison group was compared to the rate in the intervention cohort, TNT prevented an estimated 34.9 students from becoming established smokers, at an intervention cost of $16,403. Savings estimates were calculated at $13,316 per life year (LY) saved and $8482 per quality-adjusted life year (QALY) saved. These results demonstrate that TNT had cost savings over a range of model parameter estimates.

A one-year follow-up study of a school-based tobacco use prevention project disclosed that Project TNT was significantly more effective in decreasing both initial and weekly use of cigarettes than any of its individual components alone (Sussman, Dent, Stacy, Sun, Craig, & Simon, 1993). This randomized experiment of four different curricula, one for each of three social influence components (refusal skills, awareness of social misperceptions about tobacco use, and misconceptions about physical consequences) and a curriculum that combined all components, involved 48 junior high schools.
Each curriculum, except for the curriculum in which refusal skills were taught, was effective in decreasing the initial and weekly use of use of cigarettes. Only the combined curriculum showed an effect on the weekly use of smokeless tobacco. The combined intervention (TNT) was the most effective overall in reducing the initial and weekly use of cigarettes and smokeless tobacco. The authors concluded that this suggests that different reasons for use exist and need to be counteracted simultaneously.

**Life Skills Training**

In 1980 Botvin, Eng and Williams published an evaluation of the Life Skills Training (LST) program. This program, based on Bandura’s Social Learning Theory (1986), promotes opportunities for processing life experiences, structuring experiences, and actively gaining experiences. LST creates opportunities for youth to acquire skills that enable them to avoid manipulation by outside influences such as peers and the media. It teaches social resistance skills and general personal and social competence skills. In one study, rates of substance use behavior, attitudes, knowledge, normative expectations, and related variables were examined among students (N = 1090) from 20 schools. These schools were randomly assigned to either receive the prevention program (9 schools, n = 426) or serve as a control group (11 schools, n = 664). Data were analyzed at both the individual-level and school-level. Individual-level analyses controlling for gender, race, and family structure showed that intervention students reported less smoking in the past year, more pronounced anti-drinking attitudes, increased substance use knowledge and skills-related knowledge, fewer normative expectations for smoking and alcohol use, and
higher self-esteem at the posttest assessment, relative to control students (Botvin, Griffin, Paul, & Macaulay, 2001). School-level analyses showed that the annual prevalence rate was 61% lower for smoking and 25% lower for alcohol use at the posttest assessment in schools that received the prevention program when compared with control schools. In addition, mean self-esteem scores were higher in intervention schools at the posttest assessment relative to control schools. Findings indicate that a school-based substance abuse prevention approach previously found to be effective among middle-school students is also effective for elementary school students.

In another study, the authors evaluated the substance initiation effects of the LST curriculum that combines family and school-based competency-training (Life Skills) intervention components. (Spoth, Redmond, Trudeau, & Shin, 2000) Thirty-six rural schools were randomly assigned to one of three conditions: (a) the classroom-based Life Skills Training LST) and the Strengthening Families Program: For Parents and Children 10-14, (b) LST only, or (c) a control condition. Outcomes were examined one year after the intervention posttest, using a substance initiation index (SII) measuring lifetime use of alcohol, cigarettes, and marijuana and by rates of each individual substance. Planned intervention-control contrasts showed significant effects for both the combined and LST-only interventions on the SII and on marijuana initiation.

A long-term follow-up study of 447 individuals who were contacted after the end of the 12th grade, six-and-a-half years after the initial pre-test of the Life Skills Training program, found that students who received the LST program during junior high school reported less use of illicit drugs than controls (Botvin et al., 2002). These results also support the hypothesis that illicit drug use can be prevented by targeting the use of gateway drugs such as tobacco and alcohol.
Not On Tobacco (NOT)

*N-O-T* is a teen stop smoking program of the American Lung Association. It is a 10-session, gender-specific program with booster sessions that incorporates life management skills to help teens deal with stress, decision-making, and peer and family relationships. It recognizes that males and females have different reasons for starting to smoke, for quitting, and relapsing. It also addresses alcohol use and illicit drug use, as well as exercise and nutrition. A preliminary post program evaluation shows a 22.4% quit rate among teenaged cigarette smokers. Of those who continued to smoke, 65.4 percent reduced the number of cigarettes smoked during the weekdays and 75 percent reduced the number they smoked on the weekends. These results were bio-chemically validated (ALA, 2002).

Project Alert

*Project Alert* is a drug prevention curriculum for middle-school students (11-14 years old) which has been proven to reduce the onset of substance abuse and regular substance use. It is a two-year program delivered to 6th, 7th, or 8th grade students, which focuses on the substances that adolescents are most likely to use: alcohol, tobacco, marijuana and inhalants. It has 14 lessons—11 core lessons delivered the first year and three booster lessons the second year. The Rand Outcome study of Project Alert conducted in 30 California and Oregon schools found that students receiving Project Alert reduced initiation of marijuana use by 30 percent; decreased current marijuana use by 60 percent; reduced past month cigarette use by 20 to 25 percent; decreased regular and heavy cigarette use by 33 to 55 percent; demonstrated substantially reduced pro-drug attitudes and beliefs (Ellickson, Bell, & Harrison, 1993).
A recent study of the revised Project Alert curriculum was conducted in 55 South Dakota middle schools. The revised Project Alert curriculum curbed cigarette and marijuana use initiation, current and regular cigarette use, and alcohol misuse. Reductions ranged from 19% to 39% (Ellickson, McCaffrey, Ghosh-Dastidar, & Longshore, 2003). The Project Alert curriculum motivates adolescents not to use drugs and by teaching them skills to translate that motivation into effective resistance. The lessons focus on norms, beliefs about drugs, and intentions to help motivate adolescents not to use, and stress skills on how to identify and resist pressures stemming from the availability of drugs and from pressures to use (Rand, 2004).

Consider This

The Cooper Institute researchers and researchers from the University of New Mexico, the University of Arizona, and the Anti-Cancer Council of Victoria, Australia developed the Consider This interactive Web site (http://www.considerthisusa.net) using multimedia and database software and innovative communication strategies to reduce smoking among adolescents aged 11-15 (grades 6-9) with funds from the National Cancer Institute.

The CT curriculum program tailors information, discussions about tobacco use, and social skill-building to personal smoking experiences of adolescents (non-users, experimenters and regular users). The Web curriculum features six, 50-minute modules, designed specifically for the middle-school student. The content is designed to counter social pressures to smoke, debunk myths surrounding smoking, correct norms regarding youth smoking, model social skills, teach stress management techniques, promote decision-making strategies that affect children’s smoking, and
clarify personal values. Table 2.2 describes the curriculum activities and prevention principles related to each module.) These prevention principles have all proven to be successful in randomized trials on youth tobacco prevention.

Table 2.2: Consider This Program Module Activities and Prevention Principles

<table>
<thead>
<tr>
<th>Module</th>
<th>Activities</th>
<th>Prevention Principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Web site</td>
<td>• Preview</td>
<td>• Appeal for continued abstinence from smoking or to stop smoking</td>
</tr>
<tr>
<td></td>
<td>• Ground rules</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• On-line smoking survey</td>
<td></td>
</tr>
<tr>
<td>Media Museum</td>
<td>• Introduction</td>
<td>• Increase media literacy</td>
</tr>
<tr>
<td></td>
<td>• Radio studio</td>
<td>• De-glamorizes smoking</td>
</tr>
<tr>
<td></td>
<td>• Movie theater</td>
<td>• Reveal tobacco industry manipulation strategies</td>
</tr>
<tr>
<td></td>
<td>• Models activity</td>
<td>• Reveal power of media persuasion</td>
</tr>
<tr>
<td></td>
<td>• TV wall animation</td>
<td>• Debunk realism of media depictions of pop culture</td>
</tr>
<tr>
<td></td>
<td>• Pop culture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Create an ad</td>
<td></td>
</tr>
<tr>
<td>Relationships</td>
<td>• What kind of person are you?</td>
<td>• Increase social skills to improve communication and relationships</td>
</tr>
<tr>
<td></td>
<td>• Communication skills</td>
<td>• Teach peer pressure resistance skills</td>
</tr>
<tr>
<td></td>
<td>• Advice column</td>
<td>• Correct social norms related to smoking</td>
</tr>
<tr>
<td></td>
<td>• Peer pressure in the mall</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Statistics on friends</td>
<td></td>
</tr>
<tr>
<td>Mind / Body</td>
<td>• Effects of smoking on the human body</td>
<td>• Learn harmful effects of cigarette smoke on the body</td>
</tr>
<tr>
<td></td>
<td>• Substances in cigarettes</td>
<td>• Provide personalized / tailored feedback on growing addiction to nicotine</td>
</tr>
<tr>
<td></td>
<td>• Aspects of addiction / dependence</td>
<td>• Model and practice stress management techniques</td>
</tr>
<tr>
<td></td>
<td>• Perfect world</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Stressful situations</td>
<td></td>
</tr>
<tr>
<td>Decision-making and Values</td>
<td>• You pick it, you get it</td>
<td>• Model and practice decision-making skills</td>
</tr>
<tr>
<td></td>
<td>• Virtual interviews</td>
<td>• Hear testimonials of teen smokers who quit</td>
</tr>
<tr>
<td></td>
<td>• Values</td>
<td>• Clarify personal values and explore mismatch of smoking and personal values</td>
</tr>
<tr>
<td>Influences</td>
<td>• Exposing memos</td>
<td>• Reveal tobacco industry plans to target teens</td>
</tr>
<tr>
<td></td>
<td>• Smoking situations</td>
<td>• Learn to recognize smoking situations</td>
</tr>
<tr>
<td></td>
<td>• Top 10 ways to say no</td>
<td>• Model and practice skills for avoiding and resisting pressures to smoke</td>
</tr>
</tbody>
</table>

For example, Botvin (2000) demonstrated in the Life Skills Training program that by teaching students to recognize factors like the influence of mass media,
tobacco industry manipulation strategies and the power of media persuasion, students could debunk the realism of media depictions of pop culture and increase their capacity to think critically. The “Media Museum” module of the CT curriculum demonstrates the influence of the media by engaging online users in interactive learning experiences. Additionally, like Life Skills Training, CT delivers stress management activities, although these are provided in an interactive computer program.

Social norms theory provides a model for understanding human behavior that has important implications for health promotion and prevention. It states that behavior is influenced by incorrect perceptions of how other members of our social groups think and act (Berkowitz, 2002). In the case of tobacco use, correcting misperceptions that the majority of youth use cigarettes or other tobacco products is key to prevention activities. This is done in the “Relations” module of the CT curriculum. The above described activities, and others that are part of proven effective tobacco control curricula, are included in the Consider This curriculum.

The Consider This curriculum user interface is guided by a virtual host, a teenage female of uncertain racial or ethnic heritage, who leads students through activities with audio instructions and feedback. The feedback is guided by user responses to smoking history questions. These questions are asked during the course of user navigation through the curriculum modules. User responses to the smoking history questions create a user profile that is the basis of the virtual host’s interaction with the user (e.g., “The last time you were on this Web site, you told me that you were experimenting with cigarettes. Are you still experimenting?”). This tailoring aspect and the audio track provided by a peer (the virtual hostess) personalizes the Web site for the user and provides researchers with user smoking history data.
The effectiveness of CT is being tested in two National Cancer Institute funded, group randomized pretest-posttest controlled trials, one each in the United States and Australia. Preliminary analyses were conducted on 977 students (62% intervention and 28% control) who had completed a pretest and posttest questionnaire in 2001-02 in the U.S. trial. All responses were measured using a Likert scale. Since the probability of future tobacco use can be predicted from behavioral intent and susceptibility (Pierce, 1996; Norman, 1999; O’Callaghan, 1999), for the preliminary analysis, the main outcome of interest was the subjects’ response to the statement “I will not smoke in the future.” Intervention subjects showed a significant positive change (p<0.001) from pretest to posttest while the controls showed no change. When the difference between pretest and posttest scores was compared across treatment groups, a significant difference was detected (p<0.05). To visualize the impact of CT more clearly, the changes over time among intervention group children were compared with the control group changes. In the intervention group, 35.4% of the children were positively moved in their pre to post responses compared to only 17.3% of the control group. Thus, the intervention was able to have an impact on the responses in over two times as many children in the intervention group compared to the control group. Further, the percentage of children who reportedly shifted from disagreeing with the statement that they would not smoke in the future to agreeing with the statement, was differential amongst the children who did shift categories: 65.6% of the intervention students who did show a changed response to this question switched from disagreeing to agreeing compared to only 41.9% of the control students. Using McNemar’s test for the direction of the change, the intervention group moved to a more favorable status (p<0.001) compared to the
Control group that did not move. Thus, the authors feel that CT may have potential to provide inoculation against future smoking, if by nothing more than allowing the children to express that this is an option. Similar positive changes (p<0.05) were detected for intervention subjects but not control subjects in their responses to items assessing self-efficacy to refuse a cigarette offered by a friend and knowledge of the addictiveness of cigarettes and smokeless tobacco (i.e., “Smoking is as addictive as other drugs such as heroin or cocaine”).

In summary, this interactive, Internet-based curriculum tailors information and discussions about tobacco use, and presents social skill-building activities based on the personal smoking experiences of adolescents (non-users, experimenters and regular users). Student smoking status is assessed throughout the program and responsive audio messages to the student user are made by the virtual host to reinforce nonsmoking behavior, encourage self-examination of smoking behavior and attitudes, and discourage smoking. Since CT has not been fully tested, this may influence its adoption.

All of the above curricula are based on scientifically demonstrated prevention principles and have been or are being tested in the classroom. Despite positive findings and the subsequent availability of effective tobacco use prevention curricula, there remains a significant problem with tobacco use among young people. Identifying the predisposing, enabling and reinforcing factors related to adoption of tobacco prevention curricula could help mitigate this seemingly intractable problem. When exploring the school context of tobacco use and tobacco use curriculum and policies within Colorado schools, a recently completed focus group study of Colorado school principals (Rocky Mountain Center, 2002) disclosed the following themes:
• CSAP (Colorado Student Assessment Program) has a strong influence on all school decisions (This is a state required testing program that imposes performance standards on every Colorado school, with tests of funding if standards are not met.);
• Tobacco is not the highest priority for schools;
• Every school is different;
• Limited resources affect ability of schools to incorporate new programs; and
• Cultural norms of the community / parents (might) accept tobacco as “okay.”

These findings helped better inform me regarding the context of this research.

Internet Use Among Youth

While the identification of effective intervention strategies to prevent youth tobacco use is an important research step, successful implementation of effective strategies is ultimately dependent on effective diffusion of interventions to schools and communities.

One promising strategy for dissemination is delivery of tobacco prevention learning experiences via the World Wide Web or the Internet. The Internet is fast becoming a universally available tool that teens use regularly for their schoolwork. It also holds great potential since access to this tool is not confined to the school classroom and it has potential to reach teens where they live and play. Identification of the barriers to implementation of Web-based curricula should be of value to our schools and public health.
The Internet has become an important learning tool for teens and recognized as a valuable learning resource by parents. A Pew Research Center survey of 754 youths ages 12-17, conducted in the closing months of 2000, found the following:

- 98% of American public schools have some kind of Internet access for students and 77% of instructional classrooms have Internet connections [This percentage drops to 60% for schools with the highest concentrations of poverty (Cattagni, 2001);
- Only 73% of the youths surveyed use the Internet, despite the fact that the Internet is available to virtually all teens at their school;
- 94% of online youth use the Internet for school research and 78% say they believe the Internet helps them with schoolwork;
- 87% of parents of online youth believe that it helps students with their schoolwork and 93% believe that it helps students learn new things;
- 55% of parents of online youth believe that it is essential for today’s children to learn how to use the Internet and another 40% believe it is important (Lenhart, 2002).

The PEW researchers working on this study reported that there was a substantial disconnect between how students use the Internet for school and how students use the Internet during the school day and under teacher direction. They found that students’ educational use of the Internet occurs outside of the school day, outside of the school building, and outside of the direction of their teachers. A few of the factors students attributed to this disconnect were:

- The quality of student Internet-based assignments was poor and uninspiring;
• School administrators set the tone for Internet use at school. Policy choices by those who run school systems have resulted in different schools having different levels of access to the Internet, different requirements for student technology literacy skills, and different restrictions on student Internet access;

• The single greatest barrier to Internet use at school is the quality of access (connection speed and reliability) to the Internet;

• Because not every student has access to the Internet outside of school, the vast majority of students report that their teachers do not make homework assignments that require the use of the Internet;

• Students repeatedly told researchers that the quality of their Internet-based assignments was poor and uninspiring (Lenhart, 2002).

These barriers, while significant now, if not addressed soon will become even more pronounced as broadband connections become more commonplace and more students become online users. Teachers will need to become better prepared to use and/or design instructional lessons that are available on the Internet. Internet-based assignments will need to be compelling and inspire student learning. Administrators will need to become better informed about the technical and administrative barriers to effective use of the Web in schools. Change agents will need to know how to effectively deliver and disseminate Web-based tools to schools and school districts.

Other research findings indicate that use of Web technology in the educational environment can be effective in changing health practices. In a study of a Web-based computer-tailored, nutrition education program, changes in student determinants of behavior were found (Oenema, 2001). If the Internet is to become an effective
teaching tool for classroom teachers, then research needs to expand so that knowledge of effective dissemination and instructional strategies continues to develop.

Use of the Internet, like other communication media, has both benefits and liabilities. Its primary benefit for adolescents who are seeking health-related information may be the anonymity that is afforded by an interactive computer environment. One study of adolescents seeking health care found that they frequently need and want to talk with their primary care providers about health risks but often do not (Klein & Wilson, 2000). The adolescents in this study most frequently discussed healthy dietary habits (49%), weight (43%), and exercise (41%) with their clinicians, but most frequently wanted to but did not discuss drugs (65%), smoking (59%), and healthy dietary habits (57%). Overall, 70.9 percent of their study sample reported at least one of eight potential health risks, but 63 percent of these adolescents had not spoken to their doctor about any of these risks. While not tested in this study, disclosing health behaviors, especially those that are known to be socially undesirable, in an interactive computer environment, like that provided by CT, may be easier for some adolescents than talking with health care providers or parents.

Computers and Internet Access in Colorado Schools

A national market research study conducted during school year 1998-99 found that the computer-to-student ratio for Colorado schools was only slightly above the national average. There was one computer for every 5.3 students in Colorado and the national average was 5.7. These ratios compare favorably to California schools, where the ratio was little more than one computer for every 8 students, but unfavorably to Wyoming schools, where the ratio was one computer to 3.5 students.
There was one Internet computer for every 12.9 students in Colorado and one for every 13.6 nationally, and 95% of Colorado schools have Internet access compared to 90% nationwide (The Denver Post, 1999).

In conclusion, with this literature review as the knowledge and conceptual bases for this research, I pursued the identification of factors that promoted and impeded adoption, implementation and maintenance of the Web-based tobacco education and prevention curriculum entitled Consider This.
CHAPTER 3
THEORETICAL APPROACHES

This chapter discusses the primary theories (DOI and PRECEDE) that guided the inquiry and helped to shape interpretations of the data.

Identification of the determinants of Internet program usage in the classroom was done in the context of theoretical approaches to communications and behavior change. DOI identified the communications context for dissemination and adoption of CT. The PRECEDE health promotion planning and intervention model defined behavioral and environmental factors.

More specifically, this chapter describes the theoretical context within which diffusion of CT took place among study participants during the 2001/2002 school year. The teacher curriculum adoption process is described using DOI constructs (relative advantage, compatibility, complexity, trialability, observability, adoption, dissemination, and maintenance). Individual and environmental behavioral factors associated with adoption of Consider This are described with constructs from the PRECEDE model (predisposing, enabling, and reinforcing factors).

**Diffusion of Innovations**

“Given that an innovation exists, communication must take place if the innovation is to spread.”

Everett M. Rogers, (Rogers, 1995, p.17)
New ideas or innovations are adopted through a process that Rogers calls the innovation-decision process, "the process through which an individual or decision-making unit passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation and use of a new idea, to confirmation of this decision" (Rogers, 1995, p. 161). Understanding and influencing the decision-making process can help expedite adoption and influence the survival of an innovation.

New ideas or innovations often do not survive because financial support for the idea is not sustained sufficiently for the innovation to be accepted within a social system. Understanding the diffusion process, its barriers, and how it is enabled is especially important if the innovation is to be accepted and this acceptance sustained. Understanding the factors that influence diffusion of Consider This (e.g., change agents, complexity, trialability, etc.), and being able to control or manipulate those factors is vital to the viability of the program as a tool to inhibit tobacco use. Diffusion of Innovations theory provides a framework for identifying effective approaches for disseminating the Consider This program. DOI holds that several characteristics of an innovation affect its adoption (Buller, 2001).

Rogers (1995, p. 5) defines diffusion as "the process by which innovation is communicated through certain channels over time among members of a social system." He defines communication as "a process in which participants create and share information with one another in order to reach a mutual understanding" (Rogers, 1995, p. 17). Rogers contends that diffusion is a special type of communication in that the messages are concerned with new ideas. It is the newness or uncertainty of the idea that makes diffusion a unique type of communication.
Elements of the Diffusion Process

There are four elements that characterize the diffusion process:

1) Innovation Traits – The idea, practice, or object that is perceived as new by an individual or other unit of adoption;

2) Communication Channels – The means by which messages about the innovation get from one individual to another;

3) Time – The length of time it takes an innovation to be adopted or rejected by an individual or system (the innovation-decision period);

4) Social Systems – A set of interrelated units (individuals, informal groups, organizations, and/or subsystems) that are engaged in joint problem-solving to accomplish a common goal.

The following discussion of these elements in the context of the innovation that is the focus of this research helped inform the study design and instrumentation used to gather data.

Innovation Traits

Rogers contends that if the idea seems new to the individual, then it is an innovation. “Newness” of an idea may be expressed in terms of knowledge, persuasion, or a decision to adopt. The perceived traits of an innovation or idea thus influences how quickly a new idea is tried and adopted.

Rogers makes a distinction between hardware and software innovations, two broad innovation traits. Hardware innovations are equipment or tools, and software innovations are the information base for the tool. In the case of the Consider This project, the innovation is quite literally a software innovation that is accessed using
computers (hardware / equipment) available in Colorado schools. Schools have been using personal computers for approximately 20 years, and some school personnel had access to computers long before personal computers were introduced. In the strictest sense of Rogers' definition of hardware (a tool that contains the technology as a material or physical object), we could also define the Internet as the hardware that embodies the Consider This software. Without the availability of computer hardware, diffusion of this innovation would not be possible. Therefore, the most important trait of this innovation is that it is dependent on the availability of and access to personal computers.

Much of Rogers' research has been in the domain of technology. An important observation of his that is relevant to this study is included:

"A technological innovation usually has some degree of benefit for its potential adopters. This advantage is not always very clear-cut, at least not to the intended adopters. They are seldom certain that an innovation represents a superior alternative to the previous practice that it might replace." (1995, p. 13).

In the case of the CT innovation, teachers and other school personnel, as the potential adopters, may be uncertain about the benefit that an Internet-based tobacco education curriculum might provide over a traditional document-based, classroom curriculum.

In the strictest sense of the term, the only potential adopters of the CT curriculum are teachers. They are the only subgroup of school employees who have routine access to the classroom (the environment where it is implemented) and to the students who are the ultimate beneficiaries of the innovation.
Rogers contends that perceived attributes of an innovation help explain the rate of adoption of an innovation (1995, p. 206). Those attributes are described here:

1. Relative Advantage – The degree to which an innovation is perceived as better than the idea it supercedes;
2. Compatibility – The degree to which an innovation is perceived as being consistent with existing values, past experiences, and the needs of potential adopters;
3. Complexity – The degree to which an innovation is perceived as difficult to understand and use;
4. Trialability – The degree to which an innovation may be experimented with on a limited basis; and
5. Observability – The degree to which the results of an innovation are visible to others.

Innovations that have the above five qualities – more relative advantage, a high degree of compatibility, trialability, observability, and less complexity – are more likely to have higher rates of adoption.

Specific innovation attributes of the CT curriculum as perceived by the teacher participants in this study are described in the qualitative portion of this dissertation.

Communication Channels

Communication channels, another element of the diffusion process, are the means by which messages about an innovation get from one person to another. Mass media and interpersonal communications are the two principal means by which information is transmitted. Mass media channels involve radio, television,
newspapers, mass mailings, etc. Interpersonal channels involve face-to-face interactions between two or more persons.

The quality and effectiveness of communications transmitted through these two channels are influenced by the principle of homophily, i.e., the degree to which two individuals are similar in certain attributes such as education, beliefs, and social interests. Homophilous individuals share personal and social characteristics, attribute similar meanings to things and ideas, and share a mutual subcultural language. In contrast, persons who are heterophilous do not share these characteristics.

Time

The innovation-decision process is one that is measured in part by time. Time represents a) the period between an individual’s initial knowledge of an innovation to the moment of adoption or rejection, b) the relative earliness or lateness of an innovation being adopted, and c) the rate of adoption of an innovation in a social system.

The innovation-decision process consists of five steps: a) knowledge – when an individual or decision-making unit learns of an innovation; b) persuasion – when individual or unit forms a favorable or unfavorable opinion on the innovation; c) decision – when an individual engages in activities that lead to adoption or rejection of the innovation; d) implementation – when the individual puts the innovation into practice; and e) confirmation – when the individual realizes reinforcement of an innovation-decision.

Time is an important dimension explaining the innovation-decision process. Broad steps or markers of the CT curriculum adoption process were identified in both
the survey and interview portions of this investigation to help characterize the rate of adoption.

Social Systems

“A social system is a set of inter-related units that are engaged in joint problem-solving to accomplish a common goal.”

Rogers (1995, p. 23)

The social system is an environment within which change or adoption of innovations occurs. Characteristics of social systems therefore affect diffusion. More specifically, within a social system the roles of opinion leaders and change agents, social norms that relate to, enable or constrain adoption of an innovation, and the types and consequences of an innovation all affect diffusion. Formal and informal social systems within schools and school districts affect the rate and breadth of diffusion. The formal systems are those that are created by management and administration of a school district or school. The informal systems are those that are established through inter-personal communications. The communication structure (patterned communication flow) within and among schools and between school and district administrators determines who interacts with whom and under what circumstances. Understanding the dynamics of the social system and its communication structure helps define the diffusion process and its predisposing, enabling, and reinforcing factors.

Norms, or social standards, are cultural models shared by individuals in a social system which communicate to individuals what behaviors are expected and
desired. Norms therefore are often powerful factors in the diffusion process.

Personal innovativeness or adopter categories help classify members of a social system according to their willingness or tendency to adopt new ideas (Rogers, 1995). The adopter categories are as follows:

- **Innovators** – Persons or decision-making bodies who are venturesome. Their interest in new ideas tends to lead them outside of their peer networks and into a more cosmopolitan circle. They serve a gatekeeper role in the flow of new ideas into a system.

- **Early adopters** – Persons who are respected and are more integrated or active within their local social system. They have the greatest degree of opinion leadership within the social system. Ideally change agents would seek them out to help promote acceptance of a new idea or innovation.

- **Early majority** – Persons who adopt new ideas just before the average member of a system. They interact frequently with their peers and represent approximately one-third of the social system (Rogers, 1995).

- **Late majority** – Persons who adopt new ideas just after the average person in a social system. Economic necessity and/or peer pressure usually motivates adoption for this group, which is about another one-third of the social system.

- **Laggards** – Persons who are last in a social system to adopt an idea. They are near isolates within the social networks of their system and tend to be suspicious of new ideas or innovations.
Figure 3.1 below illustrates the adopter categories that will be used in the analysis of the quantitative and qualitative data collected during this investigation.

**Figure 3.1: Percent Distribution of Adopters Over Time**

- **Innovators** – those who are adventurous, who have financial resources and like to play with new tools (5%)
- **Early Adopters** – those who see strategic advantage in adopting an innovation (10%)
- **Early Majority** – followers who make a deliberate choice to adopt (35%)
- **Late Majority** – those who are skeptical and who adopt when it is less risky (35%)
- **Laggards** – those who adopt an "over my dead body" attitude (15%)

The adoption of innovation social change process began before this research project began. The CT innovation development stage (the first step in the social change process) took place in 1998 at The Cooper Institute. At this time the CT curriculum was developed for a research project testing the effectiveness of the Internet-based tobacco education curriculum described here.
Other Human Elements of the Diffusion Process

The following two human roles are key catalysts in the diffusion process.

- **Opinion Leaders** – Individuals who are able to influence informally, in a desired way and with relative frequency, other individuals’ attitudes and behaviors.

- **Change Agents** – Individuals who influence clients’ innovation-decisions in a direction deemed desirable by the agency they represent. (Note: Change agents usually use opinion leaders as their lieutenants or champions in diffusion campaigns.)

Summary of Diffusion of Innovations Constructs

Table 3.1 summarizes the principal constructs and terminology relevant to the Diffusion of Innovations theory (Rogers, 1995).

Table 3.1: Key Diffusion of Innovations Theory Constructs

<table>
<thead>
<tr>
<th>Stages of Diffusion/ Social Change Process</th>
<th>Elements of the Diffusion Process</th>
<th>Rate of Adoption Characteristics</th>
<th>Social System Member Classifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Innovation development</td>
<td>• Innovation traits</td>
<td>• Relative advantage</td>
<td>• Innovators</td>
</tr>
<tr>
<td>• Dissemination</td>
<td>• Time</td>
<td>• Compatibility</td>
<td>• Early Adopters</td>
</tr>
<tr>
<td>• Adoption</td>
<td>• Channels</td>
<td>• Complexity</td>
<td>• Early Majority</td>
</tr>
<tr>
<td>• Implementation</td>
<td>• Social System</td>
<td>• Trialability</td>
<td>• Late Majority</td>
</tr>
<tr>
<td>• Maintenance</td>
<td></td>
<td>• Observability</td>
<td>• Laggards</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Change Agents</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Opinion Leaders</td>
</tr>
</tbody>
</table>
Criticisms of Diffusion Research

There are four major criticisms of diffusion research: 1) its pro-innovation bias; 2) the individual-blame bias; 3) the recall problem; and 4) the issue of equality (Rogers, 1995, p. 99).

- *Pro-innovation bias* implies that the innovation should be diffused and adopted by all members of a social system, that it should be diffused more rapidly, and that it should not be re-invented or rejected.

- *Individual blame bias* holds that an individual is responsible for his or her problems, rather than the social system of which he or she is a part.

- *Recall problem bias* is a bi-product of the research process itself and results when individuals are asked to remember the time when they adopted a new idea or innovation.

- *Issue of equality bias* is concerned with the consequences of an innovation and how the benefits of that innovation distribute within a social system.

I observed all of these biases. For example, during the course of teacher interviews in this study, I noted the tendency of teachers to offer only positive remarks about their experiences with the adoption of the CT curriculum. In other words, they tended to share only their successes with implementation of this innovation. They seemed more reluctant to offer descriptions of the problems they encountered unless they were prompted. This is an example of pro-innovation bias or social desirability bias.

Teachers also tended to accept blame for not having successfully implemented CT in their classes. Some would make self-effacing comments about their limited experience with or knowledge of computer technology, when, in fact, the limitations
of their Internet connections may have precluded successful implementation. These self-effacing comments were sometimes made despite their knowledge of the Internet connection limitation.

Rogers (1995) suggests alternative research approaches (e.g., field studies while the innovation is being disseminated rather than post-diffusion studies) that were used on a limited basis to help explain some of the bias inherent in innovation research. One of those approaches, classroom observations, was used to help provide an objective perspective on the diffusion/adoPTION process.

Recall bias will need to be accounted for by inquiries that explore the continued dissemination of CT during the 2002-2003 school year.

Another criticism of diffusion research is that the predominant focus of diffusion studies has been on successful diffusion events and that events where diffusion was unsuccessful have not been studied (Henrich, 2000). This study effectively addressed this criticism when the design was expanded to include participants from school districts where CT may not have been implemented at all. (See Chapter 4 for a detailed discussion.)

**Related Diffusion Research**

Similar to Roger's theoretical perspective is one that focuses on the transformation processes that move organizations towards change or adoption of new instructional innovations (Kershaw, 1996). This three-step process is centered on individual behaviors. First, individuals must recognize that there is an urgent need for change in the organization. Second, individuals must come to understand that they themselves must change. Finally, they must realize that they need to change the way they perform their roles in the organization.
A more simplified model applied to faculty of educational institutions, (Geoghegan, 1995) envisions two groups of adopters: early adopters and mainstream faculty. This model characterizes early adopters as “techies” who experiment with every new technology that comes along. Mainstream faculty tends to focus more on problems, processes, and tasks at hand than on the tools that might be used to address them, and they prefer incremental change. Table 3.2 describes and contrasts the characteristics of these two information technology adopter groups.

The Geoghegan model suggests that early adopters are often poor change agents due to their lack of focus on process. Their success in using technology to bring about qualitative improvements in teaching and learning, and the visibility that can accompany such success, can have an alienating effect on others. It can foster a belief that most faculty members should be using technology and that greater access to technology and training is a prerequisite to success (Geoghegan, 1995).

Table 3.2: Adoption Categories for Information Technology Groups

<table>
<thead>
<tr>
<th>Early Adopters</th>
<th>Mainstream Adopters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favor revolutionary change</td>
<td>Favor evolutionary change</td>
</tr>
<tr>
<td>Visionary</td>
<td>Pragmatic or conservative</td>
</tr>
<tr>
<td>Strong technology focus</td>
<td>Strong problem and process focus</td>
</tr>
<tr>
<td>Risk-takers</td>
<td>Risk adverse</td>
</tr>
<tr>
<td>Experimenters</td>
<td>Want proven applications of compelling value</td>
</tr>
<tr>
<td>Largely self-sufficient</td>
<td>May need significant support</td>
</tr>
<tr>
<td>Horizontally networked</td>
<td>Vertically networked</td>
</tr>
</tbody>
</table>
Another diffusion model that is a management information systems model, based on the Theory of Reasoned Action (Glanz, 1997), is the Technology Acceptance Model (TAM), (Dillon and Morris, 1996). TAM predicts that user acceptance of any technology is determined by:

1) *Perceived usefulness* – The degree to which a person believes that the use of the new technology will enhance his or her performance; and

2) *Perceived ease of use* – The degree to which a person believes the new technology will be free of effort.

Perceived usefulness is comparable to Rogers' construct of relative advantage, and the perceived ease of use is comparable to his idea of complexity. This very simplified two-dimensional model does not acknowledge the complexities of adoption behavior, whereas DOI includes a broader range of constructs such as compatibility, observability, and trialability as adoption characteristics.

In contrast to the TAM model, Reeves (1997) describes a more complex model that seeks to explain significant pedagogical dimensions of computer-based learning. This model describes fourteen pedagogical dimensions of computer-based education (CBE) in an effort to provide improved criteria for understanding, describing and evaluating CBE. While these dimensions were identified as evaluative factors, they are suggestive of factors that may contribute to diffusion of CBE. These factors are in the philosophical, teacher, student and technical domains.

- epistemology;
- pedagogical philosophy;
- underlying philosophy;
- goal orientation;
- experiential value;
- teacher role;
- program flexibility;
- value of errors;
- motivation;
- accommodation of individual differences;
- learner control;
- user activity;
- cooperative learning; and
- cultural sensitivity.

Some of these dimensions or factors and their definitions validated adoption factors identified in the analysis of the observation and interview data collected in this study. For example, learner control was a factor that students and teachers liked about CT. Students liked that they could direct their choices from various CT learning modules with the click of a mouse. Teachers liked that their students could move through the program at their own pace.

A study of the introduction of integrated learning systems (ILS) into schools suggests five stages of teacher participation in the implementation of ILS (Clariana, 1992). These are:

- Novice, non-participatory, where a teacher drops off a class at the ILS (computer) laboratory;
- Novice participatory, where the teacher attends the classes but does not know ILS;
- Practitioner, where the teacher uses ILS progress reports to help pupils by remediation or re-teaching;
• Integrator, who manipulates the ILS sequence so that it better matches the classroom instruction; and
• Extender, who has fully integrated the ILS into classroom curricula.

This teacher classification system suggests that teachers be extenders because they are required to be in the classroom when students were logged onto CT and to integrate it into their broader health-education curricula.

One on-line discussion of the diffusion of technology in K-12 education focused on cost and instructional strategies (Recesso, 2001). Using Rogers’ DOI model and a cost analysis model, the discussants concluded that the widespread use of interface technology would result in low per student costs. To accomplish widespread use of technology it identified that teacher effectiveness is an integral issue related to the development and implementation of a technology-based interface.

One discussant stated that “The drive to create this tool (a technology-based interface) makes the assumption that teachers are also technologists ... we should discriminate between content expertise, designing and developing the content for presentation, and facilitating the learning experience” (Recesso, 2001). This quote and the surrounding discussion provide some perspective on the complexity of the technology/user interface with which teachers are confronted. While the CT curriculum does not require that teachers be designers or developers of technology, it does require that they, to some extent, be content experts and, to a greater extent, that they be facilitators of the learning experience.

This online discussion concluded that successful classroom use of a technology-based learner interface would have to overcome barriers presented by teacher training, costs, and providing a system conducive to facilitating effective
instruction. Because training was provided to teachers who were participants in this study, the effectiveness of that training was examined in this investigation.

Relevance of Diffusion of Innovations

School tobacco education programs like CT are an important component of a comprehensive tobacco control program (CDC, 1999). However, knowledge of effective school-based strategies to influence adolescents on important health topics, such as tobacco use, will have little or no impact if they are not effectively disseminated to teachers and school officials. Computer-assisted instruction has been used in schools for several years now. However, use of programs delivered over the Internet is still novel (Buller, 2001). Thus, in DOI terms, teachers who are currently using the Internet as an instructional tool are likely to be either early adopters or early majority users of computer-based instructional tools. The DOI model postulates that early users are apt to be attuned to communications from individuals and groups outside of their informal social environment (e.g., national and local education and health leaders) typically via mass media (non-localized channels) when making adoption decisions. It is reasonable to expect then that direct marketing of the CT program and its computer-based attributes by outside entities such as the developers of CT would reach early adopting schools and teachers and induce them to learn more about and use the CT program. New adopters look to earlier adopters for evidence that an Internet-based program is feasible and effective in the classroom. These adopters depend on teachers who are opinion leaders for information about the Consider This program. Identification and understanding of the diffusion or communication constructs that promote use of new or innovative instructional tools
within and among schools and school districts will help facilitate adoption of new
tools such as the Consider This, Internet-based curriculum.

**PRECEDE–PROCEED Planning Model**

This diagnostic model was established to guide public health professionals as
they apply theories of health behaviors in the community setting (Green and Krueter,
1984). It provides a structure for applying theories, in order that the most appropriate
intervention strategies can be identified and implemented. PRECEDE–PROCEED
can be thought of as a *road map*, and theories as the *routes* to a destination (Glanz,
1997). The PRECEDE acronym stands for *P*redisposing *R*eforcing and *E*nable-
*Con*structs in *E*ducational, *D*iagnosis and *E*valuation. The PRECEDE portion of the
model addresses planning variables including: individual behavior, environmental,
organizational, administrative and policy factors. This model is based on the
premise that a diagnosis of the educational *environment* is needed before an effective
intervention can be implemented. Glanz explains that this model is not a theory
*per se*, since it does not attempt to explain or predict the relationship among factors
thought to be associated with an outcome of interest. It is however, a structure within
which various theoretical approaches can be applied. This aspect of the PRECEDE
model had particular appeal to the investigator, since he was interested in explaining
not only the *social system processes* from the perspective of Diffusion of Innovations
theory, but also those *individual and environmental factors* that influence utilization
of health education curriculum in schools.
While there are nine phases to the entire PRECEDE (planning) – PROCEED (implementation) model, Green and Krueter (1991) describe the PRECEDE portion as having five phases of investigation or diagnosis:

Phase I – Social diagnosis;
Phase II – Epidemiological diagnosis;
Phase III – Behavioral and environmental diagnosis; Phase IV – Educational and organizational diagnosis; and Phase V – Administrative and policy diagnosis.

The PROCEED portion of this model has four phases:

Phase VI – Implementation
Phase VII – Process evaluation
Phase VIII – Impact evaluation
Phase IV – Outcome evaluation

The PRECEDE model enables practitioners to incorporate constructs from individual, interpersonal, communications, and organizational behavior change theories in their work. Because impact and outcome evaluations of the Consider This curriculum were not within the domain of this investigation and the PROCEED portion of the model represents implementation and evaluation phases, this research project will use only constructs from the PRECEDE portion of the model and more specifically, constructs associated with Phase 4 of this model, the educational diagnosis phase. This phase of the PRECEDE model assesses the causes of health behaviors identified in previous phases of the model. Three kinds of causes are identified - predisposing factors, enabling factors, and reinforcing factors. Enabling, reinforcing and barrier factors (PRECEDE constructs) will be identified for each of the stages of the Diffusion of Innovations theory.
**Predisposing factors** are the antecedents that provide the rationale or motivation for a behavior. They include knowledge, attitudes, beliefs, personal preferences, existing skills, and self-efficacy beliefs. In other words, predisposing factors include any characteristics of a person or population that motivate behavior prior to the occurrence of that behavior.

**Enabling factors** are those precursors that allow motivation to be realized, directly or indirectly, through an environmental factor. Enabling factors include programs, services, resources, or skills necessary for behavioral or environmental outcomes to be realized. They facilitate action and any skill or resource required to attain a specific behavior. Examples of enabling factors include accessibility to a resource, availability of that resource, and skills necessary to access or use a resource.

**Reinforcing factors** are those elements that appear subsequent to behavior and that provide continuing reward or incentive for the behavior to become persistent. These factors include social support, peer influence, significant others, and vicarious reinforcement. Simply put, these factors are rewards or punishments following or anticipated as a consequence of a behavior. They serve to strengthen the motivation for behavior.

The most significant value is using the PRECEDE model was the identification of factors that, if modified, would most likely result in behavior change. The identification process included determining and sorting these factors into PRECEDE categories / constructs (e.g., enabling, predisposing or reinforcing). For this study the factors that impeded or obstructed diffusion were categorized as *barriers* and are be reported separately, outside of the DOI or PRECEDE findings. Prioritizing these factors within each of the PRECEDE construct categories was the
concluding step in the research process. Prioritization of factors was based on the weight of research evidence or relative importance and changeability.

**Interface of Diffusion of Innovations and PRECEDE Theories**

Factors or constructs of the PRECEDE model are used to describe aspects in each of the stages of the Diffusion of Innovations model. This investigation combined constructs from the Diffusion of Innovations (the social systems approach) and PRECEDE models (individual behavioral and environmental approaches) to better understand the factors that contribute to diffusion of the *Consider This*, Internet-based tobacco education curriculum.

Using the Diffusion of Innovations model and constructs from the PRECEDE model, this study described social change and diffusion processes and identified predisposing, enabling and reinforcing factors that influenced diffusion of the *Consider This* online curriculum. Each of these models defines its constructs on the assets side of the diffusion equation. Therefore, in addition to DOI and PRECEDE-related factors, barrier factors (the liabilities side of the diffusion equation) were defined separately.

Figure 3.2 illustrates how the Diffusion of Innovations (DOI) and PRECEDE models interface. Both models are stage-based models that describe processes leading up to program or innovation implementation. The Diffusion of Innovations model represents a social process that study participants went through to disseminate, adopt, and implement the *Consider This* curriculum. While participants did not actually develop this innovation (the first step in the Diffusion of Innovations model), they did engage in activities to develop capacity for implementation (e.g., attended training). CI researchers developed the innovation.
The PRECEDE/PROCEED Model is a diagnostic health education, program planning model that “is based on the premise that just as medical diagnosis precedes a treatment plan, so should educational diagnosis precede an intervention plan” (Glanz, 1997). While the PRECEDE model represents a conscious administrative planning process, participants (teachers and administrators) may have unconsciously used a model similar to this one to diagnose tobacco use in their schools and to plan their response to identified problems.

The parallel social and individual behavior change processes represented by DOI and PRECEDE occurred simultaneously yet in different domains. The common point of interface for these models is the point of implementation or adoption. Interview and observational data collected during this investigation were fitted to this two-dimensional theoretical framework. The time period and contexts under investigation are represented by the stages that are italicized in Figure 3.2. The independent and interactive factors specific to each theoretical stage will be discussed in this research.
CHAPTER 4

SURVEY OF *CONSIDER THIS* TRAINING SEMINAR ATTENDEES (QUANTITATIVE STUDY)

Survey Background and Purposes

The survey portion of the study was conducted with the cooperation of administrators, principals, teachers, counselors, school nurses, and information technology staff who attended one of the eight *Consider This* training seminars that were offered during the 2001-2002 school year. While the overall study was initially conceived and designed to be contained within a single school district (Douglas County Schools [DCSD]), using only qualitative methods, many of the intended interviews with DCSD administrators and school principals did not take place because of difficulties scheduling and keeping appointments with the study population.

A brief telephone conversation with a principal who called me on the telephone to cancel an appointment, made it clear that middle school principals and school district administrators in this school district were very busy people who would not likely make time in their schedule for the interview. This brief telephone conversation also suggested that decisions regarding health education curricula selection were most often made by teachers—a suggestion that was later verified through this study. Hence, a focused, DCSD district-wide study using interviews as the exclusive source of information was cancelled after interviews had already been conducted with seven DCSD teachers and one administrator.
I expanded the scope of the study to include all of the educators who were trained to use CT during the 2001-2002 school year. An unforeseen benefit of this change in study design was that it enabled the collection of data from school district employees throughout Colorado whose district had not made a prior commitment to broadly implement CT, like DCSD had made. By expanding the study to include a broader population of study subjects, data became available from participants where the adoption of CT was not as widespread as it appeared to be in DCSD. Making this change in the study design addressed the criticism that diffusion research had predominantly focused on successful diffusion events, and that events where diffusion was unsuccessful had not been studied.

A cross-sectional, self-administered questionnaire that was mailed to all 147 CT trainees at the school where they were employed was selected as the method of choice, since it enabled efficient, low-cost contact with each of the CT trainees. Email addresses were not available for all potential participants so that method of distribution was dismissed. The primary purposes of this survey were to: 1) collect quantitative data that was more readily collected using survey methods than interview methods; and 2) expand the pool of study subjects who would be interviewed in the qualitative portion of the study. This survey was not a part of the training seminar evaluation, but was conducted as a separate, special study.

Survey Methods

Research Design

Three components of survey design were considered when this research was undertaken. These components were described as total survey design (Fowler, 1993).
They were a. sampling, b. question design and c. survey administration. Backstrom and Hursh-Cesar's (1981) *Characteristics of Survey Research* were used as guidelines to help assure that the survey data would be free of bias and reliable for decision making. These guiding characteristics define survey research as: 1. systematic—follows a set of orderly rules of operation; 2. impartial—selects units of the population without prejudice; 3. representative—includes representative units of the population; 4. theory-based—operations are guided by principles of human behavior and mathematical laws; 5. quantitative—assigns numerical values to non-numerical characteristics to permit uniform interpretation; 6. self-monitoring—procedures are designed to avoid unwanted biases; 7. contemporary—it is current fact-finding; and 8. replicable—other researchers using the same methods can get essentially the same results.

**Survey Sample**

A census of the entire population of participants who attended CT training seminars (n=147) was determined to be an efficient, comprehensive and feasible sampling strategy that would provide a response that would be representative of the entire study population. This approach was possible since each of the study participants had signed consent releases (at the training session they attended) to allow follow-up studies by project researchers. It was also possible since the estimated cost of its administration was within the budget that I allowed for this data collection. Since I was still employed by the Principal Investigator of the CT research project, I was able to obtain training session attendance rosters with subject identifying and contact information for purposes of this research. The survey sample
included all of the school district and local health related personnel who attended one of the eight CT training seminars offered in December of 2001 or January of 2002.

Questionnaire Design

Diffusion of Innovations theory and PRECEDE model constructs guided development of the survey questionnaire. Questions were derived to answer theoretically sound inquiries that would address the specific aims of the study. (The survey questionnaire can be found in Appendix A.)

The procedures used to develop the mailed questionnaire were procedures that I have used in previous studies. These procedures are those generally recommended by Dillman (1976), the Total Design Method for surveys, (Aday (1996) and Czar and Blair (1996). A questionnaire was drafted to answer the principal research questions using DOI and PRECEDE constructs as guides to content development. The steps employed were: 1) determine the kind of information sought; 2) structure a question; and 3) choose the words carefully. Attitudes, beliefs, behaviors and attributes were the general types of information sought (Dillman, 1976).

Field testing of the questionnaire on a subset of the study population would have biased their responses to the final questionnaire, so this method of pre-testing the instrument was not used. The draft survey instrument was reviewed for clarity and contextual language by a school administrator (personal friend) who was not a potential participant in the survey. Changes were made in accordance with feedback provided by this third party.

The logic employed in determining the content and structure of questions is described in the following paragraphs. Detailing the structure and content of the
questions helped identify the data processing requirements.

To assure that survey respondents were eligible for the study the first question on the survey instrument asked respondents if they attended one of the CT training seminars. (As mentioned above, all but one of 83 respondents answered affirmatively.)

Since there were two principal groups of seminars trainees, teaching and non-teaching school district staff, and the ability to implement the CT curriculum in the classroom was limited to the teaching group, a question was developed to determine the position held by each participant (question #2).

"The innovation-decision process is the process through which an individual (or decision-making unit) passes (1) from first knowledge of an innovation, (2) to forming at attitude toward an innovation (persuasion), (3) to a decision to adopt or reject, (4) to implementation of a new idea, and (5) to confirmation of this decision" (Rogers, 1995, p. 161). Therefore, determining how teaching and non-teaching staff first heard about CT (knowledge) is a critical step in the dissemination research process. Figure 4.1, A Model of Stages in the Decision-making Process describes all of the steps in this theoretical process.

This figure and the model it represents drove development of the survey questionnaire. It also provided a guide to the analysis of the survey and interview data. Question 3 was developed to answer the question as to how knowledge of the innovation came about. The discrete responses for this question were informed by the seven interviews conducted with DCSD employees in the early stage of this investigation and with his knowledge of Consider This promotional activity that occurred prior to the training seminars. The possible responses to question 3 acknowledged that adopters would likely hear about this innovation through the
promotional activities (the primary source) of the change agent (CT project staff) and secondary sources (their social networks).

Figure 4.1: A Model of Stages in the Decision Process

CT dissemination activities included incentives for school personnel to attend training seminars (e.g., school reimbursement for substitute teachers). Question 4, "What factors influenced your registration and attendance at this training seminar?" enabled me to identify specific factors that encouraged participants to investigate CT as a curriculum they might adopt. It was developed to address the persuasion
stage illustrated in Figure 4.1. Here once again, the DCSD interviews conducted in the early stages of this investigation helped inform the response choices that were offered. Each of the response categories added was associated with at least one of three of Rogers’ rate of adoption characteristics for an innovation (i.e., relative advantage, trialability, compatibility). For example, “substitute teacher expenses were reimbursed,” a response choice, was categorized as a factor that made it easier for teachers to try CT (trialability). Table 4.1 contains an index of how each response was categorized by DOI adoption characteristics.

Table 4.1: Factors that Influenced Registration and Attendance at CT Training Seminars by Select DOI Adoption Characteristics

<table>
<thead>
<tr>
<th>Trialability factors</th>
<th>Compatibility factors</th>
<th>Relative Advantage factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Substitute teacher expenses were reimbursed</td>
<td>• Our school needed a new or supplemental tobacco education curriculum</td>
<td>• CT is a student-directed, tailored, interactive curriculum</td>
</tr>
<tr>
<td>• Travel expense (mileage) was reimbursed</td>
<td>• CT is a student-directed, tailored, interactive curriculum</td>
<td>• Online instructional aspect of curriculum was appealing</td>
</tr>
<tr>
<td>• The training session was relatively close to my home or school</td>
<td>• Online instructional aspect of curriculum was appealing</td>
<td>• CT is free for schools to use</td>
</tr>
<tr>
<td>• Lunch was provided at the seminar</td>
<td>• I was required to go by a supervisor or administrator</td>
<td></td>
</tr>
<tr>
<td>• CT is free for schools to use</td>
<td>• CT is compatible with national education standards</td>
<td></td>
</tr>
<tr>
<td>• Continuing education credits were offered</td>
<td>• Continuing education credits were offered</td>
<td></td>
</tr>
</tbody>
</table>

Since the training seminar was the first significant exposure to CT that the participants experienced, a question (question 5) assessing the perceived helpfulness of the seminar was asked. The perceived quality or value of the seminar could have contributed to the adoption or rejection of CT.
The next series of questions (questions 6 through 10), asked of teachers exclusively, assesses their experience implementing CT in the classroom. (Non-teachers skipped to question 11.) These questions enabled the collection of data on frequency of classroom use, the school year that it was used, satisfaction with the CT program, and if teachers did not use CT, reasons for non-use. In summary, these questions provide a measure of the extent to which CT was adopted by teachers.

The next two questions (question 11 and 12) assessed teaching and non-teaching participant perceptions of their school district’s and their own rate of adoption of new or innovative ideas/technology. This data was used to determine the relationship between these self-reported adopter categories and their use of CT.

Following the rate of adoption questions, all respondents were asked to indicate their comfort level with computer technology and whether or not they had had formal training in the use of computers and/or use of the Internet (questions 13 and 14). Comfort with and training related to computer technology are enabling factors that allow participant motivations to be realized.

The closing questions were used to record respondent demographic descriptors (when they received their bachelor’s degree, if they had an advanced degree and the type of degree, gender, age and race) and smoking behavior (use of cigarettes in the past 30 days).

The final question of the survey asked the respondent if he or she was “willing to help the investigator with this research by being interviewed on the telephone.” This question enabled the identification of respondents who would become participants in the qualitative portion of the study.
Survey Administration

The survey instrument was reviewed by the statistician at Abacus Statistical Consultants prior to being mailed, to assure that the data could be processed and analyzed with relative ease. Training seminar registrant address information was extracted from CT project files, mailing labels were printed, and letters, including the survey instrument, were mailed to all 147 seminar attendees. A cover letter explaining the purpose of the study and asking potential participants to complete the enclosed survey questionnaire was mailed in late February of 2003 to all persons on the CT training seminar attendee list. Two follow-up reminder postcards were mailed to non-respondents at two-week intervals following the initial mailing. All responses were received by early April of 2003.

Eighty-three of the seminar attendees responded to the survey, for a 56% response rate. One person returned the survey and indicated that they had not attended any one of the CT training seminars and was therefore deemed ineligible for the study. Therefore, there were 82 eligible respondents who were included in the analysis of the survey data. At this point in time, the completed survey questionnaires were forwarded to Abacus Statistical Consultants for data entry into an Excel database.

Data Processing

As questionnaires were returned they were logged-in and separated into two piles. One pile contained those questionnaires whose respondents declined to be interviewed and the other included those who agreed. Email messages were sent to those participants who agreed to be interviewed to schedule a date and time for
a telephone interview. If there was no reply to the email message, approximately
two weeks from the logged-in date of the returned survey, phone calls were made to
schedule the interviews. After the telephone interviews were scheduled, the survey
data were entered into an Excel data file by a data entry operator affiliated with
Abacus and frequency distributions for each question and the data file returned to the
investigator. The receipt of this data signaled the initiation of the analysis activity.

Analysis Methods

Completed questionnaires were reviewed for completeness and clarity
of responses before they were forwarded for data entry. Extraneous marks were
removed from the completed questionnaires and responses verified by range checks.
Frequency tables of questionnaire variables were provided by Abacus and cross
tabulations produced after review of the preliminary tables. Confidence intervals or
the Fisher Exact Test was used to test statistical associations between variables.

Adoption of CT was limited to the teacher group, since this is the subgroup
of study participants that has routine access to students and works regularly in the
classroom, the intended implementation environment for CT. It was important
therefore to examine the adoption behaviors of this group separately from the
non-teachers. (It was assumed that non-teachers do not routinely plan lessons or
implement curricula in the classroom, two requirements for successful use of CT.)
Teacher responses were grouped according to their reported CT adoption behavior
and DOI and PRECEDE factors associated with each group described.
Statistical Tests

Chi-square tests of significance were used in testing tables where the expected number of cases in each cell was 5 or greater. Since there were relatively few respondents to the survey in this study (n=82), the Fisher Exact test was used to test significance for those tables where expected cell values were <5.

Findings

Study Participant Characteristics

A total of 82 persons respondend to the survey of CT training seminar attendees. Study participants who identified themselves as having positions as administrators (n=4), information technology staff (n=4), counselors (n=5), school nurses (n=5), other non-teaching positions (n=4), in their school district, and local public health agency staff (n=2) as of spring of 2002 were categorized as non-teachers in the analyses. All others (n=58) were teachers. Table 4.2 contains the frequency and percentages for demographic and smoking status descriptors for the study participants.

Seventy-five percent of the respondents were female (one person did not respond to the gender question). Seventy-one percent of the teacher participants and 87% of the non-teacher participants were female. The average age of all of study participants was 42.1 years; the median was 43 years and the mode was 44 years. The average ages for teachers and non-teachers were 41.6 years and 44.1 years respectively.
### Table 4.2: Demographic Characteristics and Self-reported 30-day Smoking Status for Consider This Survey Participants, n=82

<table>
<thead>
<tr>
<th>Gender</th>
<th>Teachers</th>
<th>Non-teachers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>17 (29.3)</td>
<td>3 (13.0)</td>
<td>20 (24.7)</td>
</tr>
<tr>
<td>Female</td>
<td>41 (70.7)</td>
<td>20 (87.0)</td>
<td>61 (75.3)</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>23</td>
<td>81 (100)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>Teachers</th>
<th>Non-teachers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 – 29</td>
<td>7 (12.3)</td>
<td>1 (5.0)</td>
<td>8 (9.8)</td>
</tr>
<tr>
<td>30 – 39</td>
<td>14 (24.5)</td>
<td>6 (30.0)</td>
<td>20 (24.4)</td>
</tr>
<tr>
<td>40 – 49</td>
<td>26 (45.6)</td>
<td>7 (35.0)</td>
<td>33 (40.2)</td>
</tr>
<tr>
<td>50 – 59</td>
<td>9 (15.8)</td>
<td>4 (20.0)</td>
<td>13 (15.9)</td>
</tr>
<tr>
<td>60 – 69</td>
<td>1 (1.7)</td>
<td>2 (10.0)</td>
<td>3 (3.7)</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td>20</td>
<td>77 (100)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Race / ethnicity</th>
<th>Teachers</th>
<th>Non-teachers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>56 (96.6)</td>
<td>22 (100)</td>
<td>78 (97.5)</td>
</tr>
<tr>
<td>Black</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Asian/Pac. Islander</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Am. Indian/Alaska Native</td>
<td>1 (2.2)</td>
<td>0</td>
<td>1 (1.2)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1 (2.2)</td>
<td>0</td>
<td>1 (1.2)</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>22</td>
<td>80 (100)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Days smoking in last 30 days</th>
<th>Teachers</th>
<th>Non-teachers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero</td>
<td>55 (94.8)</td>
<td>21 (95.4)</td>
<td>76 (92.7)</td>
</tr>
<tr>
<td>1 or 2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3 to 5</td>
<td>1 (1.7)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>30</td>
<td>2 (3.5)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>22</td>
<td>80 (100)</td>
</tr>
</tbody>
</table>

Ninety-eight percent (n=78) were white, one study participant each indicated that they were American Indian/Alaskan Native and Hispanic. Only 7 percent (n=4) indicated that they had smoked cigarettes in the past 30 days. The smokers were proportionately distributed among the position categories with three smokers being teachers.
A greater proportion of the non-teachers had advanced degrees with nearly 70% of the non-teachers having advanced degrees, compared to nearly half of the teacher group. Overall, more than half of the respondents (43) had advanced degrees, with all but one of those being a Master’s degree and that one was a Doctoral degree. As can be seen in Table 4.3, the difference between the groups on training in computers and/or Internet use was not as great as it was for advanced degrees. Eighty-seven percent of the non-teachers compared to 78% of the teachers had this training. Overall, 80% indicated that they had had training in computers and/or Internet use. See Table 4.3 above for the frequency and percent of advanced education and training.

Table 4.3: Advanced Education and Computer Training for Consider This Survey Participants, n=82

<table>
<thead>
<tr>
<th>Advanced degree</th>
<th>Teachers</th>
<th>Non-teachers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>28 (48.3)</td>
<td>15 (68.2)</td>
<td>43* (53.8)</td>
</tr>
<tr>
<td>No</td>
<td>30 (51.7)</td>
<td>7 (31.8)</td>
<td>37 (46.2)</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>22</td>
<td>80</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Training in computer and/or Internet use</th>
<th>Teachers</th>
<th>Non-teachers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>45 (77.6)</td>
<td>20 (87.0)</td>
<td>65 (80.2)</td>
</tr>
<tr>
<td>No</td>
<td>13 (22.4)</td>
<td>3 (13.0)</td>
<td>16 (19.8)</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>23</td>
<td>81</td>
</tr>
</tbody>
</table>

* Includes 42 Masters degrees and one PhD

Table 4.4 shows that 44.4% of the respondents classified their school district in the early adopter category (among the first to try) and 40.3% classified their district
as in the early majority group (*after a few others have tried*). Fourteen percent (14.2%) indicated that their district tends to adopt new ideas or innovations *after most others* or *long after most others try it*.

Table 4.4: Frequency and (Row Percent) of School District and Participant Adopter Classifications and Comfort Level with Computer Technology

<table>
<thead>
<tr>
<th>When does your district adopt new/innovative ideas?</th>
<th>Among first to try it (early adopter)</th>
<th>After a few others try it (early majority)</th>
<th>After most others try it (late majority)</th>
<th>Long after most others try it (laggards)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers</td>
<td>27 (48.2)</td>
<td>21 (37.5)</td>
<td>4 (7.1)</td>
<td>4 (7.1)</td>
<td>56 (100.0)</td>
</tr>
<tr>
<td>Non-teachers</td>
<td>5 (31.2)</td>
<td>8 (50.0)</td>
<td>2 (12.5)</td>
<td>1 (6.2)</td>
<td>16 (100.0)</td>
</tr>
<tr>
<td>Total</td>
<td>32 (44.4)</td>
<td>29 (40.3)</td>
<td>6 (8.3)</td>
<td>5 (6.9)</td>
<td>72 (100.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>When do you adopt a new/innovative idea?</th>
<th>Among first to try it (early adopter)</th>
<th>After a few others try it (early majority)</th>
<th>After most others try it (late majority)</th>
<th>Long after most others try it (laggards)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers</td>
<td>20 (35.1)</td>
<td>32 (56.1)</td>
<td>5 (8.8)</td>
<td>0</td>
</tr>
<tr>
<td>Non-teachers</td>
<td>7 (31.8)</td>
<td>12 (54.6)</td>
<td>2 (9.1)</td>
<td>1 (4.5)</td>
</tr>
<tr>
<td>Total</td>
<td>27 (34.2)</td>
<td>44 (55.7)</td>
<td>7 (8.9)</td>
<td>1 (1.2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Comfort level with computer technology?</th>
<th>Very comfortable</th>
<th>Somewhat comfortable</th>
<th>Somewhat</th>
<th>Very</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers</td>
<td>16 (27.6)</td>
<td>32 (55.2)</td>
<td>7 (12.0)</td>
<td>3 (5.2)</td>
</tr>
<tr>
<td>Non-teachers</td>
<td>11 (47.8)</td>
<td>12 (52.2)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>27 (33.3)</td>
<td>44 (54.3)</td>
<td>7 (8.7)</td>
<td>3 (3.7)</td>
</tr>
</tbody>
</table>
Teachers rated the average time for adoption of innovations by their school district as earlier than non-teachers. Forty-eight percent of teachers and only 31% of non-teachers rated their district as an *early adopter*. This finding may be influenced by the inclusion of information technology staff in the non-teacher group. IT staff may see themselves as early adopters and the organizations that they work for as later adopters, thus reflecting a likely bias towards adoption of technology innovations. They were also likely biased toward adoption of innovations. This difference seems to diminish somewhat when the early adopter and early majority categories are combined. Eighty-eight percent of the teachers and 81% of the non-teachers indicated that their school district was either an early adopter or early majority adopter. Nearly one teacher in six (15.2%) identified their school district as either a late majority adopter or laggard.

Self-reported personal innovation adoption practices or behaviors were classified using the same DOI adopter classifications as that for the school districts. One-third (33.3%) of the respondents indicated that they (personally) were among the first to try new innovations (early adopters) or ideas and over half (54.3%) adopt new ideas or innovations after most others try them (late majority). Ten respondents (12.4%) self-described their adoption behavior as adopting *after most others try* or *long after most others try*. While the percentage of participants that were personally categorized as being on the early adopter side of the normal curve (early adopters and early majority) was slightly greater than that for their school district’s behavior (89.9% versus 84.7%), it is interesting to note that 10% fewer respondents (34.2% versus 44.4%) felt that they were *among the first* to try a new idea compared to the perceived adoption rate for school districts. This suggests that some respondents felt that their school district was more innovative than themselves.
The adoption of innovations characteristics for both school district and personal adoption behaviors are skewed positively or to the right, with many more early and early majority adopters than normally expected. If adopter behavior for school districts and school personnel were normally distributed, it would be expected that approximately 50% would be in the early or early majority categories. Nearly 90% of the study participants were either early or early majority adopters. With greater than three quarters of the participants self-classifying in these categories, this suggests that self-reporting of adopter classification is significantly favorably biased. As Rogers suggests (1995, p.269), this bias may be the result of the high educational level of the study participants.

Table 4.4 also includes data on participant comfort level with computer technology (an enabling factor). One-third of all respondents indicated that they were very comfortable with computer technology (33.3%), over half were somewhat comfortable (54.3%), and 12.4% were either somewhat uncomfortable or very uncomfortable. A surprising finding was that 17.2% of teachers indicated that they were either somewhat or very uncomfortable while none of the non-teachers were uncomfortable with computer technology.

**Frequency of Teacher Use of Consider This**

The frequency of use of the Consider This curriculum in the classroom is the strongest indicator of its dissemination among study participants who were trained in 2001-2002. Among the entire study group, teachers were the only subgroup that could implement CT in the classroom. The non-teacher respondents (counselors, nurses, IT personnel, administrators, non-school district personnel) do not routinely
have instructional responsibilities in the classroom. Of the 82 school personnel who responded to the survey, 59 indicated that they were teachers and 57 of those responded to the frequency of use question. Therefore, the following analyses on use of CT are limited to the teacher subgroup.

Of the teachers who responded to the survey, 40.2% indicated that they never used CT after they were trained (Never users); 21.0% tried it briefly for one or a few class periods and did not use it again (Trial users); 21.0% used it for multiple class periods for one or two class groups (Temporary users); and 17.5% used it for three or more class groups (Adopters). Table 4.5 below summarizes the frequency of teacher use of CT in the classroom.

Table 4.5: Frequency of Consider This Use by Adopter Group (n=57)

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Frequency of CT classroom use</th>
<th>N  (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never users</td>
<td>Never used it</td>
<td>23 (40.4)</td>
</tr>
<tr>
<td>Trial users</td>
<td>Tried it for one class period and did not use it again</td>
<td>2 (3.5)</td>
</tr>
<tr>
<td></td>
<td>Tried it for a few class periods and did not use it again</td>
<td>10 (17.5)</td>
</tr>
<tr>
<td>Temporary users</td>
<td>Used it for multiple class periods with one class group</td>
<td>8 (14.0)</td>
</tr>
<tr>
<td></td>
<td>Used it for multiple class periods with two class groups</td>
<td>4 (7.0)</td>
</tr>
<tr>
<td>Adopters</td>
<td>Used it for three or more class groups</td>
<td>10 (17.5)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>57 (100)</td>
</tr>
</tbody>
</table>

Grouping teachers by reported frequency of CT usage in Table 4.5 disclosed that 40% never used CT and therefore could be classified as never users. This group failed to move past the decision stage to the implementation stage. (See Figure 4.1.) The remaining sixty-percent of teachers (34/57 or 60%), those who adopted CT for one or more classes, moved to the implementation stage. This group included the trial
and temporary users and the adopters. Among this group, the temporary users and adopters \((12 + 10 / 57 \text{ or } 48.6\%)\), was the group that moved to the implementation stage. Those who used CT for three or more class groups \((10/57 \text{ or } 18\%)\), the adopters, are those teachers who implemented CT and took actions to maintain or confirm its use. None of the teacher groups were immune from discontinued use or later adoption. So it is important to recognize that this cross-sectional review of CT use does not imply that eighteen percent of the teachers who responded to the survey surveyed (the adoption group) continued to use CT after this survey was conducted or that they were even using it at the time of the survey. As Figure 4.1 in this chapter illustrates, discontinuance by those who had adopted CT (later adoption) can occur after the implementation and confirmation stages, thus changing the size of the adoption group. Later adoption by those who had rejected CT is also possible. These adoption dynamics influence cross-sectional analyses of adoption rates.

**Dissemination**

The dissemination stage, the second stage (following innovation development) in the diffusion process model was the first stage to be assessed in this survey. For purposes of this study, those persons who were eligible to be classified in this stage were all of the participants who attended one of the CT training seminars. Those who returned a survey, a subset of this group, were those who were classified as having reached this dissemination stage for the analysis. How teachers initially heard about CT and the offering of CT training seminars (first knowledge of CT) may be an important determinant of the most effective means for promoting or disseminating CT. Survey respondents checked all of the methods by which they had heard about
the CT curriculum and specified the means by which they heard about CT that were not listed by describing them on the ‘other’ category response line. The means by which teachers heard about CT were grouped for this analysis into the following three groups. See Table 4.6 for this data.

- Promotional actions – brochure or poster received in the mail or CT project staff contacted them directly.
- In-school network (i.e., word of mouth) – principal told me; another teacher in my school told me; a district administrator told me; school nurse told me; heard at a health curriculum meeting; and previous person in my position told me.
- Out-of-school network (write-in responses) – a teacher in another school; health education consulting organization; and local tobacco control coalition.

Did the means by which teachers heard about the CT curriculum influence use in the classroom? Since CT had not previously been promoted in Colorado schools prior to the CDPHE-funded dissemination project, the brochure and poster packet mailing to Colorado middle, junior and senior high schools was likely the only way that school personnel could have heard about CT. In Table 4.6, columns 1, 2 and 3 represent the in-school responses to the question “How did you first hear about CT?” (Participants were permitted to check all responses that applied.) Column 3 is the total of columns 2 and 3, and column 5 is the total of columns 4 and 2.

Over all groups of adoption types, the data in Table 4.6 suggest that the in-school network / information channel was the most important channel by which teachers initially heard about CT and the CT training seminars. Over half of the
survey respondents (56.1%) heard about CT through in-school network channels alone or in combination with other sources. (See Table 4.6, columns 1 and 2 totaled.) One-third (33.3%) heard about CT through promotional actions alone.

Table 4.6: Frequency and (Percentages) of Classroom Use by How Teachers Heard About Consider This (n=57)

<table>
<thead>
<tr>
<th>Frequency (Column %)</th>
<th>In-school network only</th>
<th>In-school network &amp; promotion actions</th>
<th>Promotion actions only</th>
<th>Out-school network only</th>
<th>Unknown source</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never tried</td>
<td>9 (33.3)</td>
<td>2 (40.0)</td>
<td>9 (47.4)</td>
<td>1 (33.3)</td>
<td>2 (66.7)</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>(39.1)</td>
<td>(8.7)</td>
<td>(39.1)</td>
<td>(4.3)</td>
<td>(8.7)</td>
<td>(100.0)</td>
</tr>
<tr>
<td>Tried briefly</td>
<td>8 (29.6)</td>
<td>0</td>
<td>2 (10.5)</td>
<td>1 (33.3)</td>
<td>1 (33.3)</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>(66.7)</td>
<td></td>
<td>(16.6)</td>
<td>(8.3)</td>
<td>(8.3)</td>
<td>(100.0)</td>
</tr>
<tr>
<td>Tried multiple</td>
<td>6 (22.2)</td>
<td>0</td>
<td>5 (26.3)</td>
<td>1 (33.3)</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>periods for 1-2</td>
<td>(50.0)</td>
<td></td>
<td>(41.7)</td>
<td>(8.3)</td>
<td></td>
<td>(100.0)</td>
</tr>
<tr>
<td>groups</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used ≥ 3 or more</td>
<td>4 (14.8)</td>
<td>3 (60.0)</td>
<td>3 (15.7)</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>classes</td>
<td>(40.0)</td>
<td>(30.0)</td>
<td>(30.0)</td>
<td></td>
<td></td>
<td>(100.0)</td>
</tr>
<tr>
<td>Total</td>
<td>27 (100.0)</td>
<td>5 (100.0)</td>
<td>19 (100.0)</td>
<td>3 (100.0)</td>
<td>3 (100.0)</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>(47.4)</td>
<td>(8.8)</td>
<td>(33.3)</td>
<td>(5.3)</td>
<td>(5.3)</td>
<td>(100)</td>
</tr>
</tbody>
</table>

Out-of-school communication networks were largely ineffective in disseminating information about CT, with only 5.3% indicating that as the source through which they heard about CT. On face value, it could be concluded that the most important method for communicating with teachers about CT was the in-school network. However, that conclusion does not take into account the time dimension or sequence of events that led to teacher knowledge of CT. The promotional materials
and other dissemination actions (phone calls by CT project staff) that were employed created knowledge of CT and activated in-school communication networks, thereby initiating the diffusion process.

Channels of communication outside of the in-school network (column 4, Table 4.6) were the least important channels of communication, with only 5 percent of the teachers reporting that they heard about CT from outside sources. Only 8.8% of the teachers indicated that they both saw the promotional materials and heard about CT through the in-school network.

The numbers in each cell of Table 4.6 are too small to reliably draw statistical conclusions about the relationship between how teachers heard about CT and their decision to adopt, but they suggest that the in-school network is as important a means for information dissemination about CT as the promotional materials.

Did promotional actions or in-school communication channels have a greater influence on eventual adoption of this curriculum? Adoption, implementation and maintenance of an innovation were the desired outcomes of the diffusion process, so it was important to test the influence of these two dissemination methods on those outcomes. Because of small numbers, the Chi-Square statistic could not be used to test differences in usage of CT between the teachers represented in columns 1 and 4 of Table 4.6. Instead, confidence intervals were computed around the proportions in columns 1 and 4 which are independent groups. The confidence intervals were very wide and overlapped, supporting that there is no difference. (See Table 4.7.)
Table 4.7: Frequency of Classroom Use by Single Source of How Teachers Heard About Consider This

* Percent of all teachers

<table>
<thead>
<tr>
<th></th>
<th>In-school network only</th>
<th>Promotion actions only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%*</td>
</tr>
<tr>
<td>Never tried</td>
<td>9</td>
<td>33.3</td>
</tr>
<tr>
<td>Tried briefly</td>
<td>8</td>
<td>29.6</td>
</tr>
<tr>
<td>Tried multiple class</td>
<td>6</td>
<td>22.2</td>
</tr>
<tr>
<td>periods for 1-2 groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used ≥ 3 or more classes</td>
<td>4</td>
<td>14.8</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
<td>100.0</td>
</tr>
</tbody>
</table>

DOI-Related Findings by Construct

The DOI theory postulates that there are innovation factors or characteristics that influence the diffusion process. Those factors are: trialability, compatibility, complexity, relative advantage, and observability. The results of using CT, in this case were related to student tobacco use outcomes, which were not readily visible to teachers. Observability is therefore obscured just by the nature of the teacher-student relationship and a teacher's proximity to observe student smoking behavior and initiation of smoking. Therefore, observability as a diffusion factor was excluded from this analysis.

Complexity was also excluded since it could not be determined for questionnaire development how teachers would define CT complexity in their own terms. (Complexity is discussed in Chapter 5 of this study as it is described...
by teachers.) Table 4.8 describes the remaining CT adoption characteristics that influence the rate of adoption using DOI constructs.

Table 4.8: Frequency of Classroom Use by Adoption Characteristics that Influenced Attendance at CT Training Seminars Among Survey Participants (n=57)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Never users</td>
<td>22 (41.4)</td>
<td>13 (35.1)</td>
<td>14 (36.8)</td>
<td>10 (38.5)</td>
<td>13 (39.4)</td>
</tr>
<tr>
<td>Trial users</td>
<td>11 (20.8)</td>
<td>8 (21.6)</td>
<td>11 (28.9)</td>
<td>5 (19.2)</td>
<td>8 (24.2)</td>
</tr>
<tr>
<td>Temporary Users</td>
<td>11 (20.8)</td>
<td>8 (21.6)</td>
<td>8 (21.0)</td>
<td>7 (26.9)</td>
<td>7 (21.2)</td>
</tr>
<tr>
<td>Adopters</td>
<td>9 (17.0)</td>
<td>8 (21.6)</td>
<td>5 (13.2)</td>
<td>4 (15.4)</td>
<td>5 (15.2)</td>
</tr>
<tr>
<td>Total</td>
<td>53 (93.0)</td>
<td>37 (64.9)</td>
<td>38 (66.7)</td>
<td>26 (45.6)</td>
<td>33 (57.9)</td>
</tr>
</tbody>
</table>

Teachers were asked to select possible factors that may have influenced their registration and attendance at one of the CT training seminars from a list of predetermined choices (question 4 of survey instrument).

The incentives that were offered by CT project staff to schools for teachers to attend the training seminars (i.e., try CT) were factors that created a framework for trialability. Those incentives as described in the survey instrument (and in Table 4.1) were: the training seminar was free; substitute teacher expenses were reimbursed; travel expenses were reimbursed; training session was close to home or school; lunch was provided; CT free for schools to use; and continuing education units were offered.
Compatibility factors (factors that are compatible with the values and needs of teachers) included: our school needed a new or supplemental tobacco education curriculum; CT is a student-directed, tailored, interactive curriculum; the online instructional aspect of the curriculum was appealing; I was required to go by my supervisor; CT is compatible with national education standards; and continuing education credits were offered.

Two factors that influenced decisions to attend the training seminars (relative advantage factors) were: online instructional aspect of curriculum was appealing and CT is a student-directed, tailored, interactive curriculum. (Other relative advantage factors were later disclosed through the interviews conducted in the qualitative portion of this study.)

Factors listed on the questionnaire that were related to combinations of adoption characteristics were: CT is a student-directed, tailored, interactive curriculum (compatibility and relative advantage); CT is free for schools to use (trialability and relative advantage); and continuing education credits were offered (compatibility and trialability).

Table 4.8 contains the distribution of these adoption characteristics by teacher frequency of CT classroom use by teachers. This table answers the research question: "To what extent did the DOI factors that influenced training seminar attendance and registration influence classroom use of CT?" In the theoretical context this question enabled the determination of the relative importance of the DOI adoption characteristics on classroom use of CT, the decisive measure of diffusion.

Based on the weight of responses, the trialability factors had the greatest influence on teacher registration and attendance at a training seminar. Ninety-two
percent of the teachers selected these factors as motivating their attendance and registration. In other words, those factors that made it easy for teachers to attend a seminar (e.g., the seminar was free) had the greatest influence on their decision to attend. Factors that were associated with relative advantage (e.g., online instructional aspect) and compatibility (e.g., CT is student-directed) followed respectively with 66.7% and 64.9% of the respondents selecting those factors. (See total cells in columns 1, 2 and 3 of Table 4.8.)

**Characteristics of Participants Who Agreed to be Interviewed**

While this finding is related to the qualitative portion of the study, it is reported here since it was a finding from the survey. The last question on the survey was, “Are you willing to help further with this research by being interviewed on the telephone for 15 to 20 minutes?” Twenty-seven (33%) of the 82 survey respondents checked “Yes.” Seven of these participants were Douglas County School District employees who had been interviewed previously. Therefore, conducting the survey of all persons who attended one of the CT training seminars not only provided information from a broader group of teachers who were trained to use CT, but it expanded the pool of candidates eligible to be interviewed beyond the DCSD employees by 20 persons.

Survey records for those persons who agreed to be interviewed were analyzed to better understand the characteristics of this subgroup compared to those who had not agreed to be interviewed. Table 4.9 describes the results of the most significant findings in that comparison.
Those who agreed to be interviewed were more likely to be early adopters (p<.05), to have received their undergraduate degree in 1990 or after (p<.02) and be trial users or adopters of CT (p<.04). Interviewees also tended to think that the training session was very helpful vs. helpful (p<.02).

Table 4.9: Frequency and (Percent) of Interviewed and Non-Interviewed Participants by Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Interviewed</th>
<th>Not interviewed</th>
<th>Total</th>
<th>Fisher Exact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adopter characteristic</strong></td>
<td>Early adopter</td>
<td>13 (54.2)</td>
<td>14 (25.5)</td>
<td>27 (34.2)</td>
<td>p&lt;0.05</td>
</tr>
<tr>
<td></td>
<td>Early majority</td>
<td>9 (37.5)</td>
<td>35 (63.6)</td>
<td>44 (55.7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Late majority</td>
<td>2 (8.3)</td>
<td>6 (10.9)</td>
<td>8 (10.1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>24 (100.0)</td>
<td>55 (100.0)</td>
<td>79 (100.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Year Graduated</strong></td>
<td>Before 1990</td>
<td>10 (43.5)</td>
<td>41 (74.6)</td>
<td>51 (65.4)</td>
<td>p&lt;0.02</td>
</tr>
<tr>
<td></td>
<td>1990 or after</td>
<td>13 (56.5)</td>
<td>14 (25.4)</td>
<td>27 (34.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>23 (100.0)</td>
<td>55 (100.0)</td>
<td>78 (100.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Frequency CT classroom use</strong></td>
<td>Never / Temp. User</td>
<td>6 (37.5)</td>
<td>29 (70.7)</td>
<td>35 (61.4)</td>
<td>p&lt;0.04</td>
</tr>
<tr>
<td></td>
<td>Trial User / Adopter</td>
<td>10 (62.5)</td>
<td>12 (29.3)</td>
<td>22 (38.6)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>16 (100.0)</td>
<td>41 (100.0)</td>
<td>57 (100.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Close to home</strong></td>
<td>Yes</td>
<td>12 (50.0)</td>
<td>15 (25.9)</td>
<td>27 (32.9)</td>
<td>p&lt;0.05</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>12 (50.0)</td>
<td>43 (74.1)</td>
<td>55 (67.1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>24 (100.0)</td>
<td>58 (100.0)</td>
<td>82 (100.0)</td>
<td></td>
</tr>
</tbody>
</table>
Table 4.9 (Continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Interviewed</th>
<th>Not interviewedd</th>
<th>Total</th>
<th>Fisher Exact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used 2002-2003 School Year</td>
<td>Yes</td>
<td>9 (81.8)</td>
<td>11 (44.0)</td>
<td>20</td>
<td>p&lt;0.07</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>2 (18.2)</td>
<td>14 (56.0)</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>11</td>
<td>25</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>CEUs were offered</td>
<td>Yes</td>
<td>20 (83.3)</td>
<td>35 (60.3)</td>
<td>55</td>
<td>p&lt;0.07</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>4 (16.7)</td>
<td>23 (40.0)</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>24 (100.)</td>
<td>58 (100.0)</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td>Was training helpful?</td>
<td>Yes, Very</td>
<td>19 (79.2)</td>
<td>26 (47.3)</td>
<td>45</td>
<td>p&lt;0.02</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>5 (20.8)</td>
<td>29 (52.7)</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>23 (100.0)</td>
<td>55 (100.0)</td>
<td>79</td>
<td></td>
</tr>
</tbody>
</table>

Those who were not interviewed tended to indicate that two incentives, continuing education credits (p<.07) and the close proximity of the training to their homes or schools (p<.05) influenced their decision to attend a training.

The survey also disclosed that those participants who did not agree to be interviewed were more likely to indicate that a reason for registering and attending a CT training seminar was that “it was close to my home or school” (p<.05, Fisher Exact Test). Also closely associated with registration and attendance for non-interviewees, but not statistically significant (p<.07), was “continuing education credits were offered.” This suggests that the participants who were interviewed tended to be more cosmopolite.
Factors Associated with Teacher Adoption of Consider This

Due to the relatively small numbers of respondents to the survey, the frequency of CT use categories were collapsed from those described in Table 4.4 above. Never users and trial users were collapsed into one group and temporary users and adopters in another for this section of the analysis. The Fisher Exact Test was used since the expected number of cases in a cell was, for some tables, less than 5. Teacher frequency of CT use data were compared to the following DOI-related constructs and demographic variables: how they heard about CT (p=NS); factors that influenced registration for a training seminar (p=NS); personal and school district adoption characteristics (e.g., early adopter, late majority, etc) (p=NS); comfort level with computer technology (p=NS); formal training in use of computers or Internet (p=NS); year undergraduate degree was received (p=NS); advanced degree (p=NS); gender (p=NS); and age (p=NS). None of these variables was statistically associated with adoption of CT. Not finding significant associations between DOI constructs and adoption practices of teachers signified the importance of the qualitative portion of this study.

Discussion

Rogers noted that pro-innovation bias is “the implication in diffusion research that an innovation should be diffused and adopted by all members of a social system, that it should be diffused more rapidly...” (1995, p. 100). Rogers also observes that, “The early adopter is respected by his or her peers, and is the embodiment of successful, discrete use of new ideas” (1995, p. 264). These characteristics of the early adopter are highly desirable and therefore very likely bias participant
perception of their own behavior and the practices of their school district in the early adopter direction. This natural tendency of identifying oneself with early adoption behavior, in combination with the high educational level of all of the teachers, probably accounted for much of the positive skewing. This pro-innovation bias and the resultant lack of adequate discrimination in the theoretical classification of participants may also have contributed to the lack of significant findings relating frequency of CT use and DOI diffusion constructs.
CHAPTER 5

INTERVIEWS WITH CONSIDER THIS TRAINING SEMINAR ATTENDEES (QUALITATIVE STUDY)

Introduction

Semi-structured interviews with twenty-four study participants who agreed to help with this study. The information they provided through the interviews enriched the data collected with the survey. This was particularly important since the quantitative findings were in conclusive regarding identification of factors that were associated with adoption of CT and because the breadth of experiences of teachers and administrators with use of CT could not be captured alone using survey methods. The interviews and a classroom observation provided a rich source of text data and valuable experiential data from which an enhanced understanding of the factors that influenced dissemination and adoption of CT was obtained.

Background

Context of Wave I Face-to-Face Interviews – DCSD

Interviews with DCSD participants were conducted face-to-face in the work place (office or school) setting. I arrived at interview sites approximately 15-20 minutes early to observe activity in each middle school and school administrative office. While this observational time in the school buildings was very brief, it helped provide a context for understanding responses to interview questions.
Most of the middle school buildings in DCSD were built in the past ten to fifteen years. They were all bright, spacious environments. All of the buildings visited had signs on their front doors stating, “Welcome to Our Tobacco-free School!” These signs were indicative of the school district’s effort to comply with a state law (CRS-25-1-101) and a school district policy that requires that school campuses be tobacco-free. With school security being very high, in a post-Columbine and post-911 environment, other door signs directed all visitors to “Check-in” at the school office. There were however, no obvious signs of increased security. Considering that the I had not visited these buildings prior to the interviews, and was therefore an unfamiliar face, the school receptionists or office secretaries were cordial and helpful. They called the teachers who were appointed to meet with me after the class period that was in progress was over. I was escorted to the classroom where the teacher was located or the teacher came to the office to meet the investigator. When class periods changed, the halls were alive with adolescent energy and banter. Students carrying backpacks talked with and jostled one another and talked comfortably with teachers in hallways. Parents visited school offices to take their child to doctors’ appointments and other personal business. Office secretaries provided assistance to students, teachers and visitors alike. Middle schools in Douglas County are bustling environments with periods of relative quiet while classes are in session and a river of adolescent hallway activity between classes.

Four of the eight DCSD interviews were conducted during the school day, between study participant classes. The remaining four interviews were conducted respectively, two after school hours in an empty classroom, one in a turn of the century school building converted for administrative offices and in the home of one of the health teachers.
Context of Wave II Telephone Interviews with Non-DCSD Participants

Wave II interviews were conducted on the telephone since it was not practical to do face-to-face interviews with teachers who resided or worked in locations throughout the state of Colorado. Additionally, the timing of these interviews coincided with the summer recess for Colorado schools. For these reasons, it was necessary to conduct the interviews over the phone. All but one of these interviews was conducted while the participant was in his or her home. That interview was conducted while the participant was working at a summer job.

Sample

Six of the 24 participants (25%) interviewed were males and 9 (including 8 teachers) were employees of DCSD. Aside from the 9 DCSD participants who represented suburban Denver, interview subjects were from various regions of the state including the northeast and east-central plains of Colorado (Logan, Morgan, Weld, and Lincoln counties), the mountain region including Fremont, Park, Routt, Hinsdale and Delta counties. In one of the smaller rural school districts the participant was also the school district nurse. In another, the health teacher was also the special education teacher.

Based on the survey data, 5 (31.25%) of the interview participants were never users; 1 (6.25%) was a trial user; 4 (25%) were temporary users and 6 (37.5%) were adopters. Sixteen (66.7%) were females; 9 (37.5%) were less than 35 years old, 8 (33.3%) between 35 and 40, and 7 (29.2%) were 45 years old or older; 2 (8.3%) were smokers; 1 participant was non-white; 10 (41.7%) had advanced degrees; 13 (56.5%) graduated from college in 1990 of after; 18 (75.0%) had some training in IT or use
Table 5.1: Demographic Characteristics, Self-reported Smoking Status, Education, IT Training, Frequency of CT Use, Comfort with Computers and School District and Personal Adoption Characteristics of Interview Participants (n = 24)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>8 (33.3)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>16 (66.7)</td>
</tr>
<tr>
<td></td>
<td>&lt;35</td>
<td>9 (37.5)</td>
</tr>
<tr>
<td>Age</td>
<td>35-44</td>
<td>8 (33.3)</td>
</tr>
<tr>
<td></td>
<td>45+</td>
<td>7 (29.2)</td>
</tr>
<tr>
<td>Race / ethnicity</td>
<td>White</td>
<td>23 (95.8)</td>
</tr>
<tr>
<td></td>
<td>Non-white</td>
<td>1 (4.2)</td>
</tr>
<tr>
<td>Smoking status</td>
<td>Non-smoker</td>
<td>22 (91.7)</td>
</tr>
<tr>
<td></td>
<td>Smoker</td>
<td>2 (8.3)</td>
</tr>
<tr>
<td>Year of under-grad degree</td>
<td>Before 1990</td>
<td>10 (43.5)</td>
</tr>
<tr>
<td></td>
<td>1990 or after</td>
<td>13 (56.5)</td>
</tr>
<tr>
<td>Advanced degree</td>
<td>Yes</td>
<td>14 (58.3)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>10 (41.7)</td>
</tr>
<tr>
<td>Training on IT or Internet use</td>
<td>Yes</td>
<td>18 (75.0)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>6 (25.0)</td>
</tr>
<tr>
<td>Frequency of CT classroom use</td>
<td>Trial</td>
<td>1 (6.2)</td>
</tr>
<tr>
<td></td>
<td>Temporary</td>
<td>4 (25.0)</td>
</tr>
<tr>
<td></td>
<td>Adopter</td>
<td>6 (37.5)</td>
</tr>
<tr>
<td></td>
<td>Very comfortable</td>
<td>10 (41.7)</td>
</tr>
<tr>
<td>Comfort with computer technology</td>
<td>Somewhat comfortable</td>
<td>13 (54.2)</td>
</tr>
<tr>
<td></td>
<td>Somewhat uncomfortable</td>
<td>1 (4.2)</td>
</tr>
<tr>
<td></td>
<td>Very uncomfortable</td>
<td>0</td>
</tr>
<tr>
<td>School district characteristic</td>
<td>Early adopter</td>
<td>13 (59.1)</td>
</tr>
<tr>
<td></td>
<td>Early majority</td>
<td>5 (22.7)</td>
</tr>
<tr>
<td></td>
<td>Late majority</td>
<td>6 (13.6)</td>
</tr>
<tr>
<td></td>
<td>Laggard</td>
<td>1 (4.6)</td>
</tr>
<tr>
<td>Personal characteristic</td>
<td>Early adopter</td>
<td>13 (54.2)</td>
</tr>
<tr>
<td></td>
<td>Early majority</td>
<td>9 (37.5)</td>
</tr>
<tr>
<td></td>
<td>Late majority</td>
<td>1 (4.2)</td>
</tr>
<tr>
<td></td>
<td>Laggard</td>
<td>1 (4.2)</td>
</tr>
</tbody>
</table>
of the Internet; all but one was either very comfortable or comfortable with computer technology; 18 (81.8%) identified their school district as either early or early majority adopters, and; 22 (91.7%) classified themselves as either early or early majority adopters. (See Table 5.1 for this descriptive data.)

Although it was a survey finding mentioned in Chapter 4, those who agreed to be interviewed were more likely to be early adopters (p<.05), to have received their undergraduate degree in 1990 or after (p<.02) and be trial users or adopters of CT (p<.04). Interviewees also tended to think that the training session was very helpful vs. helpful (p<.02).

Methods

This study used a naturalistic inquiry design (Creswell, 1998) with interviews that were guided by an interview guide developed to gather information on the experiences and perspectives of the participants. The interview guide questions encouraged participants to tell stories about their perspectives and experiences regarding dissemination and use of CT, so I could capture real world situations without the predetermined constraints or biases that are nearly unavoidable with using survey methods.

Interviews in Wave I were conducted face-to-face in school settings in the Spring of 2002, while school was in session. Interviews in Wave II were conducted on the telephone during the summer of 2002 when it was necessary to interview participants in their homes.
Interview Guide Development

To help assure that topics relevant to this investigation were addressed by study participants during the interviews, a semi-structured interview guide was developed that allowed study participants to freely describe their experience with CT within the context of focused, open-ended questions that were theoretically based.

The semi-structured interview format, the investigator’s introductory remarks, and consent process helped assure that participants would respond to my questions in an open and detailed manner. The participants’ familiarity with the CT product and their previous contact with staff of the CT project also contributed to the ease with which the interviews were arranged and conducted. All of the study participants immediately acknowledged their familiarity with CT when contacted to schedule an interview.

The questions included in the Wave I and II interview guides were structured to take advantage of three methods of questioning: depth interviewing to intensively plumb a particular topic; oral histories to get in touch with personal experience of some event; and critical incidents technique to allow semi-structured exploration of defining moments (Crabtree and Miller, 1999). Depth interviewing was the predominant approach to the interview with participant oral histories being freely related to the investigator. Pre-determined probes were included on the interview instrument to cue me about follow-up questions, should the participant provide a limited response. One open-ended question (Question 5 on Interview Guide—Appendix B) was designed specifically to elicit both positive and negative critical incidents from study participants.
Interview Process and Disposition of the Interviews

After obtaining signed informed consent from each participant to be interviewed and approval to record the interview (See Appendix C.), for both the face-to-face and the telephone interviews, a tape recording was made using a Sony Microcassette-Corder, M-560V. One tape was used for each interview. Completed interview recordings were secured in a locked file cabinet in the investigator’s home.

There were two waves of interviews. Wave I of the interviews was conducted face-to-face with 9 employees of the DCSD. Wave II was conducted after the survey portion of this investigation (Chapter 4) was completed with 15 non-DCSD employees who attended a CT training seminar. The Wave II interview guide was abbreviated, eliminating the Wave I quantitative questions that were included in the survey. (See Appendices C and D for the DCSD interview guide [Wave I] and the revised guide [Wave II] respectively.)

A purposeful sampling strategy that included 147 Colorado educators who were trained to use CT, had returned surveys, and who agreed to be interviewed was used to select participants for interviews. All 13 of the DCSD employees who were trained to use CT consented to help with this study at the time of the CT training seminar. However, only 9 of the 13 potential participants (69%) agreed to schedule a time to meet for a face-to-face interview with the investigator. With one exception, the interviews were conducted at the school or administration building where each DCSD employee worked. In that case, I met this teacher at his home, because it was more convenient for the participant. This wave (Wave I) of interviews produced 8 interviews with 9 DCSD employees (one paired interview) between March 10 and April 17, 2003.
Wave II interviews (n=15) with non-DCSD school district staff from around the state, were scheduled and conducted over the telephone after the close of the 2002-2003 school year, beginning July 3 and finishing August 17, 2003. This wave of interviews was conducted during the summer months, with calls to study participants at their homes. Home phone numbers and email addresses were provided to me on the returned survey forms. At least 2 contacts (telephone or email) were made with each participant. During the first contact, the interview date and time was scheduled. The second contact was a telephone call and the interview itself.

The context for the Wave II telephone interviews was highly variable, and the influence that variability may have had on participant oral histories was unknown. Wave II interviews differed from Wave I in the following ways. The telephone interviews were all conducted during the summer months of 2003, whereas the face-to-face DCSD interviews were conducted that spring, while school was still in session. One participant was interviewed on the telephone in his home, just a week after the death of a close family member. In fact, the initially scheduled interview had to be re-scheduled due to this family loss. Another participant was interviewed in an office while working a summer job, where she tended the telephone for a seasonal family business. She was also babysitting her grand daughter while tending the office phone and being interviewed. A third participant was a single person who had just awakened in the late morning after a late night of partying. Each of these examples suggest that these contexts of Wave II interviews differed from the classroom or administrative offices where Wave I interviews were conducted.

It appears that the participants who were interviewed on the telephone during the summer months of 2003 were generally more relaxed and at-ease in their
responses to the investigator’s inquiries. Based on their tone of voice, they seemed to have a more philosophical perspective or laissez faire attitude about their recent CT teaching experiences than if they were still facing the day-to-day activities of their job. The promptness of the participant responses suggested that the participants did not have difficulty recalling CT-related events. Hence, there were no discernable distinctions in the responses to the investigator’s questions that could be attributed to the time lag between the face-to-face interviews in the spring and the telephone interviews during the summer.

Table 5.2 displays the disposition of the interviews from this purposeful sample. Twenty-one teachers, 1 school district administrator, 1 school nurse, and 1 local public health agency tobacco control employee were interviewed for a total of 24 completed interviews.

Table 5.2: Disposition of Study Participants (n=147)

<table>
<thead>
<tr>
<th>Participants and Interviews</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total school personnel trained to use CT and surveyed</td>
<td>147</td>
</tr>
<tr>
<td>n of participants who responded to survey</td>
<td>82</td>
</tr>
<tr>
<td>n of participants who agreed to be interviewed</td>
<td>27</td>
</tr>
<tr>
<td>n of participants lost to follow-up</td>
<td>3</td>
</tr>
<tr>
<td>n of Wave I interviews (DCSD participants)</td>
<td>9</td>
</tr>
<tr>
<td>n of Wave II interviews (non-DCSD participants)</td>
<td>15</td>
</tr>
<tr>
<td>Total n of interviews (included 1 paired interview)</td>
<td>24</td>
</tr>
</tbody>
</table>

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Limitations of Telephone Interviews

The telephone interview process was a convenient and practical method for completing the qualitative portion of this investigation. However, it precluded observation of the school environments where participants worked. Not being able to gather observational field data that may have been valuable to the understanding environmental influences on adoption of CT was the single-greatest limitation of the telephone interviews. For example, not being able to observe the technical capacity of the middle schools (e.g., computer laboratories, age of computers, attractiveness of work environments) where participants taught, meant that the investigation had to rely exclusively on participant reported data. It also precluded serendipitous encounters with other school staff persons who may have been able to identify factors that influenced adoption of CT. One such encounter occurred subsequent to an interview with one of the DCSD teacher participants. While getting a participant-led tour of the school where an interview took place, the tour was interrupted by a chance hallway encounter with the school IT staff person. During this encounter, a barrier to use of CT identified during the interview with the teacher participant in that school was discussed with the IT person and as a result, more fully disclosed. The teacher told me how she was unable to download the plug-ins required to operate CT. She reported that she tried for two hours to download the plug-ins without success. As suspected by the investigator, during this hallway conversation, the IT staff person mentioned that the district had a firewall in place that restricts teachers and other staff from downloading files from the Internet that are not authorized and that IT staff assistance was needed to download plug-ins.
This chance encounter was particularly compelling since it revealed three important potential barriers to adoption – 1) limited teacher knowledge of the administrative barriers to computer network operations; 2) inflated teacher self-perceptions of their ability to work effectively within school computing environments; and 3) a possible communication gap between teachers and information technology staff as evidenced by this participant’s unwillingness or seeming reluctance to request technical support for computer related problems. (These observations are discussed in the Social System Dynamics section below.) It was not possible to gather field data when interviewing study participants on the telephone. Non-verbal cues and messages other than those that were auditory were not possible to observe.

Data Transcription, Coding, and Analysis

The recorded tapes of participant interviews were transcribed to MS-Word documents by a professional office support service. Printed copies of the transcripts were reviewed and edited by the investigator. When the transcribed text was not clear (e.g., obvious wrong word or blank space), I corrected the text and in some instances listened to the tape to clarify and repair the text in the transcribed interview document. The interview documents were then imported into ATLAS/ti®, a software package for processing large bodies of textual, graphical and audio data (Atlas-ti, 2004).

Each interview transcript was read thoroughly and pre-determined and emerging codes were assigned to phrases and text passages that described the perspectives and experiences of participants using the Atlas program. Emerging
codes were added as the text was read after a few transcripts had been read. The text was coded using the ATLAS/ti drag and drop method of code assignment. Atlas memos were created for text passages to re-describe or assign a new meaning or observation that was made during the coding process. These memos facilitated the analysis of the text data once the analysis or synthesis phase was formally underway. Creating memos represented the first step in making the transition from the coding phase to the analysis phase. The text data was analyzed to identify the principal or underlying themes that influenced dissemination and adoption of this online tobacco education curriculum. This approach was chosen because it leads to "practical understandings of meanings and actions" (Miles & Huberman, 1994).

Table 5.3: Codebook for Coding Text Data from Interviews with Colorado School Personnel Who Were Trained to Use Consider This, 2003

| Diffusion of Innovations Codes | • Relative advantage  
| • Compatibility  
| • Complexity  
| • Trialability  
| • Observability |
| PRECEDE Codes | • Predisposing factors  
| • Enabling factors  
| • Reinforcing factors |
| Emerged Codes | • Capacity  
| • Adoption barriers  
| • Adoption process  
| • Channels  
| • Continuing education policies  
| • Adoption reasons  
| • Non-adoption reasons  
| • Technical support |

Coding of the data was done using a codebook that was comprised of constructs from the DOI and PRECEDE theories. As I read and coded text passages,
other codes emerged. This template organizing style (Crabtree and Miller, 1999) was adopted because it provided a readily constructed codebook for interpreting the text data. It was also flexible enough to allow the addition of new codes that explained phenomena outside of DOI and PRECEDE theoretical constructs. The initial codebook consisted of the codes/constructs described in Table 5.3.

The codebook expanded as I encountered the data and other interpretive perspectives became apparent. Some of the other codes that were added include: capacity, adoption barriers, adoption process, channels, continuing education policies, adoption reasons, non-adoption reasons and technical support.

In order to effectively manage the breadth of text data and develop analyzable categories, code families were created. Code families were created by grouping codes that may have had overlapping or related meanings. For example, when coding began, text chunks that related to relative advantage (both positive and negative) were coded as Reladv. As coding progressed, the code Barriers was introduced as a distinct code that reflected the relative disadvantages or obstacles to adoption of CT. Hence, it became important to separate relative advantages and barriers into distinct families when creating code families. The grouping of text into families did not however preclude analyses that pulled-apart families.

To assure that the codes assigned were categorized into appropriate families, a quality check was conducted before the analysis commenced. The text data in each code family was reviewed and selected quotations were extracted from the Atlas files to create quality-controlled MS-Word files that were more homogeneous. These second generation or extracted families of Word files were the basis for the final analysis and synthesis of the data, created to facilitate another reading of transcript excerpts, and to facilitate final document preparation.
Themes were established within each of the theoretical constructs by either interpreting the text on face value or by figuratively stripping away the events and narrative content, leaving the meaning of what was intended. Meaning most often emerged after reading and re-reading interview transcripts, but frequently a participant articulated a theme very clearly through an explicit statement or through emotional, non-verbal expressions (e.g., auditory sighs, raised tone of voice, raised eyebrows, etc.).

**Classroom Observation**

One of the DCSD participant teachers invited me to observe her classroom. This single observational event, while the students were using CT, provided the most complete picture of the context within which teachers used CT in the classroom. This particular teacher, who was also the IT instructor at this middle school and was recruited to teach health after the school health teacher (a person who was trained to use CT) left her position at the close of the previous school year. Since the new teacher’s classroom was one of the school computer labs, it was a natural extension of her teaching assignment to use CT. (This teacher was not trained by Cooper Institute staff to use CT. In this case, chance played a part in adoption of CT.) A brief account of that classroom observation follows in the Findings section of this chapter.
Findings

DCSD School and Community Environments

It was apparent from the observations during the school visits that DCSD was a predominately white, affluent suburban school district. Very few non-white students were observed in hallways or classrooms. The data in Table 5.4 confirm this observation. U.S. Census data for 2000 reveal that nearly 90% of Douglas County residents were white and the median household income for 2000 was nearly $83,000. Another indicator of the affluence of this county-wide school district was that bond issues for DCSD were passed by voters in 1997 and 2000, a time period when school bonds in many other Colorado counties were not approved.

Table 5.4: Douglas County School District: Profile of Demographic, Geographic and Economic Indicators

<table>
<thead>
<tr>
<th>Douglas County School District Profile*</th>
<th>Douglas County 2000 Census Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Fastest-growing school district in Colorado: 32,000+ students in FY2000 (11,000 in 1988, 3,000 new students and 300+ teachers in 2000)*</td>
<td>• The estimated median household income for 1999 was $82,929.**</td>
</tr>
<tr>
<td>• 51 schools (including 6 charter schools)</td>
<td>• Population estimate 215,226 as of January 1, 2003) **</td>
</tr>
<tr>
<td>• $120 million bond for construction (fall 1997, and again in 2000)</td>
<td>• Race distribution: White (non-Hispanic) 89.7%; Hispanic 5.1%; Asian; 2%; African American 1%; other 2.2%. ***</td>
</tr>
<tr>
<td></td>
<td>• Large suburban area (867 square miles) located between Denver and Colorado Springs.**</td>
</tr>
<tr>
<td></td>
<td>• 191% population increase between 1990 and 2000 made it the nation's fastest growing county for the decade. Double-digit growth is predicted to continue through 2025.</td>
</tr>
</tbody>
</table>


*** http://quickfacts.census.gov/qfd/states/08/08035.html, March 2, 2004
Based on observations from teacher-guided tours of the schools where interviews took place, each school had at least one computer lab with 30 or more computers and approximately 8 to 10 computers in its library. Two of the 7 schools visited had two fully equipped I-Mac computer labs with 25 to 30 computers in each, one lab for seventh and one for eighth grade.

Classroom Observations

The middle school computer lab where I observed students using CT had 31 I-Mac computers, one for the teacher and the remaining computers for student use. On the day of the observation the students arrived in the lab, and took seats at their computer stations. The teacher introduced me and told the students that, "Mr. Young works for the company that built Consider This. He would like to watch you use the program and may ask you a few questions when we are done today." The students placed headphones over their ears and logged-on to the CT program by clicking the URL that the teacher had previously pasted into the browser address box of each computer in the computer lab. The classroom was almost instantaneously quiet and remained so for approximately 20 minutes. Students were transfixed, focusing on the computer monitor, headphones on their ears and hands manipulating the keyboard and mouse. At approximately 20 minutes into the class period, there was some growing disruption in the class. Seven or eight students had been knocked off of their Internet connection or their computers were locking-up. A quick scan of the classroom revealed that trouble was encountered when the students had reached the Media Mall section of Module 3 of CT, a section that was particularly demanding of bandwidth.
Douglas County elementary and middle feeder schools shared a T1, high bandwidth Internet line with their local high school. Thus when Internet traffic in those five or six schools peaked, the T1 line had insufficient capacity to carry the demanded bandwidth load. The CT Media Mall activity is especially bandwidth demanding because of the audio and video content and the interactive nature of that page, so when many students would encounter this page simultaneously a bottleneck would result and computers would lock-up.

This IT/health education teacher was especially prepared to deal with this technical problem and the resultant disruptive behavior that quickly spread through the students who were no longer online. Quick to recognize this technology problem, she helped many students log back onto the Internet and others she redirected to complete a written ten-question quiz that she had prepared and distributed at the beginning of the class period. (Sample quiz questions were available from the CT teacher's manual.) The class re-grouped after this disruption and continued working on the CT program, but never completely regained the previous level of focus that was enjoyed during the first twenty minutes.

Ten minutes before the end of this 50-minute class period, the teacher had the students remove their headphones, stop the customary middle school youth, classroom banter and discuss the lessons that they had learned that day. A few of the students expressed their surprise at all of the poisons that are included in tobacco and tobacco smoke and one was especially "grossed-out" that rat poison (arsenic) was included. When asked what they liked and disliked about the CT program, a few students spoke up. One said that he "liked the way that the program was about me and how it was private." Another said that he "did not like the voice of the girl who
talked on the program," the virtual hostess. A third student expressed frustration that he was kicked-off the program and then could not return to the place where he left off.

Despite the problems encountered with the technology, the teacher capitalized on this imperfect learning opportunity by discussing the lessons and having the students complete and hand-in their written quiz. During the class period, she repeatedly reminded the students that they would be graded on the CT quiz. Students were free to discuss quiz answers among themselves before handing the quiz to the teacher. The skill with which this IT/health teacher managed the classroom and the technology problems preserved the learning experience for these seventh grade school students.

This classroom observation was extremely beneficial for an improved understanding of the classroom context in which CT was implemented. This observation occurred in what may have been the best of circumstances, since this teacher was the only health teacher interviewed who had formal responsibility for teaching computer classes. She was also particularly adept at managing adolescent behavior.

The lessons learned from this classroom observation were as follows:

- Students became fully engaged in the CT program once they were logged on and the headphones in place. The audio, video and interactive functionality was captivating;
- The content appeared to be new and informative;
- Students liked the tailoring and privacy features of CT;
• While this teacher demonstrated exceptional classroom management skills in the computer lab, classroom management for teachers less comfortable with computer technology would most likely be very challenging; and
• Frustration in getting and keeping the program to function on the Internet by teachers and students was evident and was a barrier to implementation.

Diffusion of Innovators, CT Adoption Characteristics

Study participant perceived attributes of the CT curriculum itself are important to understanding adoption of this innovation. In a review of dissemination research literature Rogers found that 49% to 87% of the variance in the rate of adoption is explained by five attributes – relative advantages, compatibility, complexity, trialability and observability (Rogers, p. 206). The following section of the Findings reports the CT adoption attributes that study participants identified.

Relative Advantages. Study participants disclosed the following attributes of the CT website as relative advantages over other tobacco education curricula: a) “up-to-date and correct information, statistics;” b) “gives correct information in a manner that middle school kids really sort of latch onto;” c) “put-together in a logical way;” d) “web-based;” e) “allows for differentiation” (appeals to a variety of learning styles); and f) convenient to use.

The relative advantages of using CT that were disclosed through the interviews include those factors in Table 5.5.
Table 5.5: Relative Advantages to Using the *Consider This* Tobacco Prevention Curriculum

<table>
<thead>
<tr>
<th>Relative Advantages of <em>Consider This</em></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Up-to-date, accurate information</td>
<td></td>
</tr>
<tr>
<td>• Free for schools to use</td>
<td></td>
</tr>
<tr>
<td>• Convenient for teachers to use</td>
<td></td>
</tr>
<tr>
<td>• Allows for teacher differentiation of learning styles</td>
<td></td>
</tr>
<tr>
<td>• Appeals to students</td>
<td></td>
</tr>
</tbody>
</table>

Up-to-date Information. This attribute may be a reflection of either outdated text-based information now available to teachers or the ease with which teachers and students can access tobacco-related information from this web-based program.

Delivery Method. The method or structure by which the information is presented or delivered was identified as a relative advantage. Most of the teachers interviewed who had used CT referred to its positive appeal to kids and the modular structure of the curriculum and/or the Teacher’s Manual. These were the most widely mentioned advantages over other curricula. (CT has six 30 to 50 minute, interactive visual and auditory modules that are sequenced to structure student learning and to facilitate teacher management of the learning experience.)

The reference to “web-based” (relative advantage ‘d’ above) was a specific reference to the need for information that is readily accessible to small, remote school districts where adequate “financial resources and interactions with other teachers and other districts do not exist.” Therefore, “web-based” is a euphemism for “free-of-cost.” Three teachers indicated that they did not have a tobacco education curriculum in their school, so for these teachers it was a new resource against which they had no existing curriculum to compare CT.
Allows for Differentiation. "CT was especially nice for kids at different reading levels,” it also “provides variety” and “another avenue of learning.” These statements reflected the sentiments of many teachers who saw the CT program as a learning approach that allowed for “differentiation” in learning styles and abilities. Differentiation was another emergent theme that intersected with both the DOI and PRECEDE models, with it being both a relative advantage and a reinforcing factor. One-third of the study participants characterized differentiation as a reinforcing factor (one that they identified as an incentive for them to continue its use). This factor had not previously been identified by the change agents or innovators of CT (Cooper Institute researchers) as a predisposing factor (rationale or motivating factor), one that could be used to promote adoption. The differentiation advantage of CT is also reflected in the more discriminatory analysis of Relative Advantages that follows—an analysis of teacher observations of student responses to CT.

Expanding on her mention of differentiation as an advantage of CT, one teacher referenced “learning styles” and “multiple intelligences” and Gardner’s work in this area (Gardner H., 1999). According to Gardner individuals develop coping strategies to compensate for their weaknesses and capitalize on their strengths. In his work he identified three principle learning styles - visual, auditory and kinesthetic and seven types of multiple intelligences. This teacher had apparently observed that using the CT curriculum required use of all three learning styles. Multiple intelligences are seven different ways to demonstrate intellectual ability. (See Table 5.6.)
Table 5.6: Gardner’s Multiple Intelligence Types

<table>
<thead>
<tr>
<th>Multiple Intelligence Types</th>
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<tbody>
<tr>
<td>• Visual/Spatial Intelligence</td>
</tr>
<tr>
<td>• Verbal/Linguistic Intelligence</td>
</tr>
<tr>
<td>• Logical/Mathematical Intelligence</td>
</tr>
<tr>
<td>• Bodily/Kinesthetic Intelligence</td>
</tr>
<tr>
<td>• Musical/Rhythmic Intelligence</td>
</tr>
<tr>
<td>• Interpersonal Intelligence</td>
</tr>
<tr>
<td>• Intrapersonal Intelligence</td>
</tr>
</tbody>
</table>

While not planned to be responsive to the multiple intelligences model, CT’s instructional design includes educational activities that require visual/special intelligence (a physical manipulation game), bodily/kinesthetic intelligence (manipulation of the mouse), musical/rhythmic intelligence (listening to young persons playing a guitar), interpersonal intelligence (role-played peer interactions) and intrapersonal intelligence (students examine methods to resist the media and learn ways to deal with stress). This teacher recognized that CT activities address all but the Verbal/Linguistic type of intelligence, for a learning experience that engages students by appealing to their preferred learning style or intelligence type. This curriculum therefore, helps teachers “differentiate” or appeal to a variety of learning styles for a more relevant student learning experience.

Convenience. While this term was not used expressly, convenience was a theme that emerged as an implicit relative advantage of CT during the interviews. The following quotes from teachers suggest that CT was convenient or easy for teachers to use.
“(CT) is really nice. It had all the activities planned out. You didn’t really have to put a lot of time into lesson plans...you just went through the lesson itself so you knew what the kids would be doing...there wasn’t a lot of outside time involved.”

“I do not have to come up with the curriculum myself.”

“As a teacher I think the one nice thing is it pretty much runs itself. Basically (as a teacher) you’re just there (in the classroom).”

“So it was nice not having to come up with those lessons, those activities for students to be doing.”

“Very easy for teachers; you basically, if you don’t want to, you don’t have to do anything. I mean you really could just put the kids in front of the computer and they would get a wonderful tobacco program. And you wouldn’t have to do anything.”

“It’s easy to create worksheets and worksheets are already created for you so you can tailor it to your own classes in any way that you want and that’s a positive.”

“It’s really nice it had all the activities already planned out; you didn’t really have to put a lot of time into lesson plans.”
These statements suggest that CT provided a break from the arduous tasks that are associated with planning lessons and leading classroom activities. Convenience is another adoption factor that intersects both the PRECEDE and DOI models. It is both an enabling factor and a relative advantage. In this regard, it could perhaps be a powerful factor when promoting or encouraging teachers to adopt the CT curriculum.

Relative Advantages for Students (Teacher Perspectives). Teachers often represented the interests of students in their response to questions regarding the advantages of using CT. As educators, they were able to see how students responded to CT and often interpreted those responses as advantages over traditional "pencil and paper" learning. I observed that since teacher-reported student reaction to the curriculum was very favorable, teachers responded favorably to the curriculum, despite technology problems that they may have encountered. Following are a few teacher quotes that reflect the advantages to students.

"I think they'll stick with it because you know they can jump from one area to the other."

"They like the activity part of it, they like the fast paced part of it, they like, ah, as a way of learning as opposed to pencil, paper - they love to be on the computers, ah, they think it's fun."

"The kids really do enjoy it and they get the knowledge and they get the activities that they need in order to make good decisions about smoking, so that's the whole purpose of the thing."
"For the most part, the kids enjoy the computer and they've been raised with it. As a consequence I think it probably would be very advantageous if they could do something they enjoy and pick up some learning at the same time..."

Compatibility. Based on the DOI model, adoption of new technologies is in part dependent upon the extent to which an innovation is compatible with the values, experience and needs of the population of possible adopters. This analysis identified many factors that make CT compatible with teacher, school and school district values, experience and needs. Table 5.7 summarizes the compatibility factors associated with use of Consider This.

Table 5.7: Compatibility Factors Associated with Use of the Consider This Tobacco Prevention Curriculum

<table>
<thead>
<tr>
<th>Compatibility Factors Associated with Consider This</th>
<th>Consider This Tobacco Prevention Curriculum</th>
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<tbody>
<tr>
<td>School athletic values</td>
<td>• School athletic values</td>
</tr>
<tr>
<td>Interest in hands-on (tactile) instructional methods</td>
<td>• Interest in hands-on (tactile) instructional methods</td>
</tr>
<tr>
<td>Role modeling of non-smoking behavior</td>
<td>• Role modeling of non-smoking behavior</td>
</tr>
<tr>
<td>Support for continuing education</td>
<td>• Support for continuing education</td>
</tr>
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</table>

School Athletic Values. A few participants mentioned that educating middle school children about tobacco use is compatible with “school athletic values.” Smoking has long been acknowledged as being incompatible with athletic performance and as a reason for teens (especially boys) to want to quit. (Cooper, Gey, & Bottenberg, 1968; Aung, Hickman, & Moolchan, 2003) CT compatibility with school athletic values is therefore, not only a factor that influences adoption through school values, but it is one with a valid scientific basis.
Tactile Experience. Many participants mentioned that they were supportive of instructional methods or tools, such as CT, that are “hands-on” and that CT also satisfied middle school student interests in using computers. Since CT requires direct manipulation of the keyboard and mouse to navigate through each of the six modules, it is a hands-on or tactile experience for students.

Role Modeling of Nonsmoking Behavior. The quantitative portion of this study (Chapter 4) determined that smoking prevalence among the study participants is 5.6%. This low prevalence rate is approximately one-fourth of the adult population smoking rate in Colorado (CDC, 2004). Clearly, most teachers value nonsmoking behavior. One participant summed up the predominant sentiment of many when she stated:

“It doesn’t seem that we have very many teachers or other staff members that use tobacco or smoke cigarettes. I think that’s a powerful message to the kids.”

Role modeling, implied in this quotation, was therefore an underlying theme that was compatible with teacher nonsmoking values and one that appeared to influence nearly all study participants. With one exception (a participant who identified himself as a smoker on his survey response), all of the participants interviewed reflected this value. When asked to describe CT during a telephone interview, this participant stated the following:

Teacher: “I’d say it’s (CT) a very progressive, integrated technology program. I wouldn’t say it’s very unbiased. It’s certainly one-sided to get students to stop smoking.”
Investigator: "Do you think your smoking influences your attitude about the curriculum?"

Teacher: "No. I could be happy to teach a non-smoking curriculum."

While his words reflected that he may have upheld the role-modeling value, his tone of voice when the tape transcript was re-played and his use of the word "could" cast some doubt on the sincerity with which he would teach a tobacco education curriculum. With this possible exception, role-modeling of healthy behavior is a predominant value of teachers that makes CT compatible with teaching interests and personal values. This compatibility increases the likelihood of curriculum adoption.

Support for Continuing Education. Working in an educational setting necessarily means that participants value education, and for themselves, continuing education. Training or continuing education incentives, like those offered to schools and teachers when CT was first introduced, are compatible with teacher interests and needs. Teachers are also required to complete continuing education hours to retain their license to teach in Colorado. Every study participant indicated that their school district encouraged their pursuit of continuing education opportunities. While being compatible with teacher values and needs, this factor is also supported by a state continuing education statute and Colorado Department of Education’s License Requirements. In this regard, it is also a predisposing policy factor.

Complexity. The degree to which an innovation is perceived as difficult to understand and use, its complexity, is one of the DOI characteristics that influences the rate of adoption. Complexity can be described in two domains—the broad technological domain and the narrower CT curriculum content domain. Rogers’ suggests that innovations like CT are not viewed singularly by individuals, but as an interrelated bundle of new ideas (1995, p 235). In this study, teachers most often
discussed the CT curriculum with little distinction between the CT software and the medium that delivered it, the Internet. This lack of clear boundaries is what Rogers called a *technology cluster*. (This concept is discussed in some greater detail in the *Barriers* section of this chapter.) Table 5.8 summarizes the complexity factors associated with use of *Consider This*.

In the technological domain, problems with downloading the plug-ins and bandwidth problems were most frequently mentioned. The technical terms that teachers used in the interviews are suggestive of the perceived complexity of CT. Some of the common used terms that suggested the complexity were: downloading plug-ins, firewalls, and bandwidth. Each of these phrases or words has become an increasingly recognized part of the vocabulary surrounding use of computers.

Table 5.8: Complexity Factors Associated with Use of the *Consider This* Tobacco Prevention Curriculum

<table>
<thead>
<tr>
<th>CT Complexity</th>
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<tbody>
<tr>
<td></td>
<td>• New terms like downloading, firewalls and bandwidth suggest that CT is complex.</td>
</tr>
<tr>
<td></td>
<td>• The CT program itself was easy for students and teachers to use.</td>
</tr>
<tr>
<td></td>
<td>• Reliable Internet access was a problem that defined CT as complex for some teachers.</td>
</tr>
<tr>
<td></td>
<td>• Teachers with limited knowledge of computer technology were not successful.</td>
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</tbody>
</table>

**Downloading Plug-ins and Firewalls.** Downloading plug-ins (programs available on the Web that enable operation of certain aspects of a software program) enable the CT program to operate is an essential technological action that must take place in order for the CT curriculum to operate. It is a relatively simple process of
entering a website address in a browser address box and clicking the ‘GO’ button or in the case of CT clicking on hypertext on the CT registration page. However, if school computers were networked and IT staff had installed a firewall to protect the computer system, then downloading the plug-ins most likely required assistance from a system administrator to bypass the firewall. This was the first obstacle that many teachers faced when trying to access CT. To many teachers, it was one of the definitive actions required that defined the curriculum as complex to some users. Three of the interviewed teachers: 1) did not know that firewalls even existed in the world of computer technology; or 2) if they knew firewalls existed, they did not recognize that a firewall on their computer system was blocking the plug-in downloading operation; or 3) did not know what to do to bypass the firewall if they recognized that their system had one. For these teachers, accessing the CT program was complex. None of the three teachers who reported that they were unsuccessful with downloading the plug-ins, due to encounters with a firewall, ever used CT in their classrooms.

Bandwidth. Bandwidth is defined as “the amount of information that can be carried in a given time period (usually a second) over a wired or wireless communications link. It is expressed as bits (of data) per second (SearchNetworking.com, 2004). Websites with audio, video, and interactive features like CT demand a lot of bandwidth in order to operate efficiently. In addition to the program itself requiring lots of bandwidth, when multiple users are using the same Internet connection simultaneously, the communications path can be overloaded causing the connection to be broken or “lost.” This very problem was encountered by all of the teachers who used CT.
Investigator: "Any negative experiences with Consider This that you can remember?"

Teacher: "You know, it comes down to the number of students trying to get on there at the same time. Things are just very slow at times and, as you know, with any Internet use, it's going to fluctuate throughout the day. You know, in the morning we were probably pretty good about getting in there and getting stuff done, but as the afternoon rolled around, end of the day, or for me starting at about 1:40 or so, later in the day it was really slow and we were starting to have a lot of problems with, you know, computers locking up, and not being able to get into certain modules."

The above quotation is another example of how teachers perceive CT as a technology cluster, and not as a software program distinct from the Internet service connection.

The observed complexity was not however, a problem that discouraged use of CT for all teachers. It appears that the teachers who used it successfully acknowledged and accepted the limitations of using Internet technology by either limiting the number of students who were on the website simultaneously or by staggering student start times on the program to avoid creating a bandwidth bottleneck. CT bandwidth bottlenecks occurred when too many students encountered a particularly bandwidth intensive activity of the CT program simultaneously (e.g., Media Mall in Module 3).

The complexity of the CT program itself (distinct from the technology cluster) was unanimously reported by those who used it to be very easy. When asked, "How easy was it for you to try Consider This?" the following two responses were typical: "Oh, terribly easy," and "I thought it was pretty simple. I thought it was very well
done. It flowed very well..." In summary, CT was perceived to be simple to use, yet the complexity of computer technology was a deterrent to use for many teachers.

**Trialability.** The degree to which an innovation may be experimented with on a limited basis, or its trialability, is one of the five DOI key characteristics of an innovation that is adopted rapidly. This characteristic is very closely associated with the complexity of CT and especially with the complexity in the technological domain. Since downloading plug-ins and circumventing computer network firewalls is a precursor to trying CT, if a teacher cannot navigate these technical obstacles, then the innovation will not be tried.

Once this obstacle is circumvented and a broadband Internet connection is accessed, any teacher who has access to the World Wide Web and who is comfortable with computer technology can "try" CT at this address: [www.considerthisusa.net](http://www.considerthisusa.net).

**Observability.** Perhaps the most difficult DOI construct to define in this investigation was the degree to which the results of the CT innovation were visible to others. The observability realm was divided into process and outcome domains. This investigation was not intended to determine measurable impacts or outcomes that the CT curriculum had on student use of tobacco—the outcome domain. So the findings described here were limited to the observations that teachers made about use of CT, the process domain.

Since CT classes were held in the isolation of school computer labs and schools were isolated from each other, there was little opportunity for outside observers (i.e., potential adopters) to witness the immediate influence or process of CT. None of the teachers who successfully used CT reported that other teachers had observed their classes. Additionally, outside of the DCSD teacher participants, there
was no evidence of any interaction among teachers regarding CT after they attended the training seminars. In conclusion, despite its easy access on the World Wide Web, the lack of identifiable factors that promote observability of CT appears to be irrelevant to the successful adoption of this innovation.

**Social System Member Characteristics.** Among the teachers and administrators interviewed in DCSD, there were two who stand out as early adopters. These participants were also opinion leaders within their school district. Brief case descriptions of these participants follow.

The first of these cases, a school district administrator, could be characterized as an *innovator*. This participant’s leadership or gatekeeper actions, encouraging adoption of CT and interest in new ideas, led teachers “outside of her peer network” toward a more cosmopolitan tobacco education approach. In this administrative capacity, this person used positional or formal authority to require that other school district employees attend one of the CT training seminars.

The second case, a teacher in a large school district, self-identified as an *early adopter*. This individual’s influence regarding CT within the school district was referenced by three other participants who were interviewed, thus indicating that this person was also an *opinion leader*. This teacher was particularly adept at navigating the technical computing environment and he encouraged teachers who discontinued use of CT due to technical difficulties to try it again. The following is evidence of this observation. “Somebody from a different school said it really went fine and he didn’t have any problems, so I thought, great we’re all set.” (This ‘somebody’ was later identified in this interview to be the opinion leader to whom this case is referring.) His informal leadership was recognized and acted upon by his peers.
These opinion leader cases demonstrate that organizational or formal authority and earned or informal authority can influence the adoptive behaviors of others in their organizational and social networks (e.g., work places). These participants (opinion leaders) were members of a social system (school district) who were able to “influence attitudes or overt behavior informally in a desired way with relative frequency” (Rogers, 1995, p.27).

**Communication Channels / Diffusion Networks.** How study participants first heard about CT and more specifically, the communications channels through which they heard about it are potentially important adoption facilitators. Rogers defines a communication channel as the means by which messages get from one individual to another (1995, p.18). The survey portion of this study (Chapter 4) disclosed that teachers most often heard about CT through sources other than the mailed brochures and letters that were sent via a general mailing addressed to health education teachers and principals to middle at middle, junior and senior high schools. The interviews verified that intra-school communications channels were the most frequently mentioned channel through which study participants heard about CT. Some quotations and a narrative dialogue that illustrate this finding follow:

Teacher: “My principal asked me to attend the training here in [city name].”

School nurse: “I was approached by the PE / health teacher at my school.”

Teacher: “I think I originally heard about Consider This from one of our counselors [who] came to us with something, with a pamphlet.”

Investigator: “How did you first hear about Consider This?”

Teacher: “By a mailer that came to the school.”

Investigator: “Now did you receive the mailer?”
Teacher: “Actually my principal did.”

Investigator: “And then he or she forwarded it to you, is that right?”

Teacher: “Yes.”

There were only two references to inter-district communications and these were made by teachers who worked in rural areas of the state.

Investigator: “How did you hear about the Consider This curriculum?”

Teacher A: “Schools up and down I-70, occasionally we will get together and we’ll discuss things that are going on with our school…”

Teacher B: “Actually from the middle school health teacher in [city name]. She’s a friend of mine…”

Social network communications among teachers played an important role in how teacher first heard about CT.

**PRECEDE Adoption Characteristics**

In contrast to the DOI model which addresses characteristics that are specific to the innovation itself, the PRECEDE model encompasses broad environmental factors. PRECEDE constructs include:

- the social/environmental motivation or rationale for adoption (predisposing factors);
- the factors that allow this motivation to be realized (enabling factors); and
- the rewards for adoption that are created or emerge subsequent to the desired behavior (reinforcing factors).
These PRECEDE model factors are associated with successful program implementation in the community or social domain.

**Predisposing Factors.** The rationale for adoption includes multiple factors that predispose an innovation to being adopted by social system members. The predominant themes that emerged through the analysis of predisposing factors for CT program adoption are described in Table 5.9.

Laws and Policies. School district tobacco free policies, the state law (CRS, 25-14-103.5) that requires schools be tobacco-free and teacher certification requirements requiring continuing education are influential factors that motivate adoption of CT and other tobacco education curricula.

Table 5.9: Predisposing Factors Associated with Adoption of Consider This Tobacco Prevention Curriculum

<table>
<thead>
<tr>
<th>Predisposing Factors for Adoption of CT</th>
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<tbody>
<tr>
<td>• School district policies on health education and tobacco use;</td>
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<tr>
<td>• State and local laws that discourage sale to and possession of tobacco by minors;</td>
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<tr>
<td>• State standards for teacher certification; and</td>
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<tr>
<td>• Teacher interest in and pursuit of alternative instructional methods.</td>
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</table>
In Douglas County there is also a youth access law that makes it illegal for merchants to sell and youth to purchase or possess tobacco. This backdrop of state and local laws provides a clear societal pronouncement of the importance of preventing youth from becoming addicted to tobacco. Every participant interviewed described that their school did not allow tobacco use in the school building or on the school grounds and that there were very few violations of this policy. The following quotation from one of the teacher study participants sums up the general sentiment among the participants interviewed.

"We have zero tolerance as far as the students are concerned. No cigarettes in the school, none in their lockers and that type of stuff."

Standard Seven (Knowledge of Technology) of the Colorado Standards for Teacher Certification is a predisposing factor that influences adoption. (See Table 5.10 and; Colorado Standards, 2000.) This standard, while not explicitly referenced by any of the participants, establishes an expectation for teacher performance that is in the policy domain. DCSD participants and a few others reported that as a matter of school district policy, they are encouraged to integrate technology into their teaching.
Table 5.10: Teacher Certification Standard Seven: Knowledge of Technology

<table>
<thead>
<tr>
<th>Standard Seven for Colorado Teacher Certification; Knowledge of Technology</th>
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<tbody>
<tr>
<td>The teacher is skilled in technology and is knowledgeable about using technology to support instruction and enhance student learning. The teacher has demonstrated the ability to:</td>
</tr>
<tr>
<td>7.1 Apply technology to the delivery of standards-based instruction.</td>
</tr>
<tr>
<td>7.2 Use technology to increase student achievement.</td>
</tr>
<tr>
<td>7.3 Utilize technology to manage and communicate information.</td>
</tr>
<tr>
<td>7.4 Apply technology to data-driven assessments of learning.</td>
</tr>
<tr>
<td>7.5 Instruct students in basic technology skills.</td>
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</table>

Health education is a required course in some school district middle schools, with a state law declaring health education to be “a voluntary program in which school districts and boards of cooperative services may participate through the creation of local comprehensive health education programs” (CRS, 22-25-104). Subsection (1) of this statute defines “tobacco, alcohol, and other drug use” as a topic that shall be included. This law, despite its voluntary compliance nature, appears to have established a motivation, or at least the backdrop, within which school districts developed health education programs.

Alternative Instructional Methods. A motivating or predisposing factor for adoption of CT that was predominant among the participants interviewed was that CT provided an alternative method for teaching and student learning. “It’s an alternative to paper and pencil teaching.” The interviews disclosed that teachers were interested in and looking for teaching methods that would make the subject matter more compelling for students. Teachers reported that their students were interested in and enjoyed working on computers. CT was recognized as an alternative teaching tool and therefore a motivating factor for teachers to pursue adoption.
Two teachers mentioned their “sense of community” or “wanting to resolve what was heard to be an increase in youth smoking” as predisposing factors. This intrinsic motivational factor may have been more broadly inherent among the participants interviewed, but it was mentioned too infrequently and without enough conviction to be included as a significant predisposing factor.

The demise of DARE (Drug Abuse Resistance Education, a law enforcement substance abuse prevention program) and the need for a replacement program or curriculum that discouraged tobacco use was mentioned by one participant as a reason or motivation for trying CT.

DCSD health educators reviewed their health education standards for 7th graders and determined that either Project Alert or CT should be taught. This recommendation was forwarded to the DCSD Curriculum Council. This internal school district recommendation made by DCSD health educators provided at least some minimal rationale for DCSD use of CT.

The above mentioned broad predisposing factors provided the rationale or foundation for adoption of the CT curriculum.

**Enabling Factors.** Factors that motivate a teacher to try a curriculum (predisposing factors) are not enough by themselves to assure adoption of that curriculum. Schools and school districts must have resources, systems, strategies and peer networks that enable them to adopt a curriculum or new technology.

The enabling factors that are associated with adoption of the Consider This curriculum are summarized in Table 5.11.
Table 5.11: Enabling Factors Associated with Use of the Consider This Tobacco Prevention Curriculum

<table>
<thead>
<tr>
<th>Enabling Factors for Adoption of CT</th>
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</thead>
<tbody>
<tr>
<td>- Computer availability and accessibility</td>
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<tr>
<td>- Teacher knowledge of and skill with computer technology</td>
</tr>
<tr>
<td>- Teacher access to peer networks</td>
</tr>
<tr>
<td>- Support for continuing education</td>
</tr>
<tr>
<td>- Specific CT training</td>
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<tr>
<td>- Teacher self-motivation / determination</td>
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<tr>
<td>- Information technology support.</td>
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</tbody>
</table>

Computer Availability and Accessibility. Computer availability and accessibility were found to be core factors which enable adoption. This finding was discovered by disclosing what teachers who successfully used CT did not say about computer availability and access and contrasting it against those who had significant problems. Teachers who successfully accessed and used CT did not report having significant difficulties with computer availability and access. It was implicit in the text of those interviews that computers were available and accessible. Since DOI and PRECEDE are assets-based models (models that tend to be biased toward adoption), liabilities or barriers like lack of availability and access to computers are not discussed here. Instead, barriers are discussed in the Emergent / Non-theoretical Adoption Characteristics section of Chapter 6.

Teacher Knowledge and Skill. Teacher knowledge of and skill with computer technology were identified as an enabling factor. The following interview excerpt with a teacher who taught science and health in a small, rural Colorado school with students in all grade levels, illustrates how teacher knowledge and skill can enable not
only adoption of CT but can promote adoption of technology in the broader realm.

Investigator: “What do you teach?”

Teacher: “I really don’t, like I say, the kids are all doing computer classes, college classes and high school classes with instructors at different locations. You see, we’re a very small school district and we don’t offer a lot of the classes that kids want. So we have a fair number of kids doing these computer courses through different community colleges...Brigham Young University, and then we have a local Colorado organization for online classes as well...”

Investigator: “So it sounds as though most of the instruction is on-line?”

Teacher: “One hundred percent.”

Investigator: “So what about access to computers? What kind of access do you have?”

Teacher: “My classroom is set up with 18 IBM compatible computers. We have a T1 line, and the kids are on those computers just about every period all day long. We’ve got some kids doing two or three classes in my room. Some can attend college classes as long as they also meet high school requirements... There is one class some of the kids like to take; it’s Social Problems. I can’t remember exactly the name of the class, something to do with social and biomedical problems and things in the present and it gets into cloning, but it also in that case talks about health in which they’re worried about diet and smoking and some things like that. But they’re working with an instructor at the other end.”

Investigator: “Are these classes for the more advanced students?”

Teacher: “I have first through fifth graders that are pushing the gifted and
talented area and need something more, something faster. I have a group of
seventh and eighth graders that were behind in their English skills, almost
remedial in a way, and so they came over and started a lower level class and
we worked them up almost to grade level last year.”

This teacher’s knowledge of and comfort with technical language and creative use
of computer technology to advance student learning was indicative of his knowledge
and confidence in the technology domain. Based on the interviews conducted in
this study, it appears that the teacher qualities that this teacher possesses are still the
exception. While he used CT on a limited basis and made it available as an option
for students, the above exchange illustrates how with his knowledge, he was able
to integrate technology into his classroom. He brought educational resources and
experiences to a school that would otherwise have been without them.

Peer Networks. Access to peer networks or social/communication systems
within schools are an enabling factor that help assure that teachers hear about CT and
get feedback on use of CT that helps encourage continued attempts to try it, if they
were unsuccessful at first. After being asked, “Did you ever see a flyer, a brochure on
Consider This?” one teacher responded,

“I didn’t, but see, a lot of times if something comes into the office about health
education, they’ll put it in [my supervisor’s] box because he’s our department
head, and then he’ll get that information out to the rest of us.”

After reporting that he had been unsuccessful at using CT because of the
bandwidth problems, another teacher indicated that the success of a teacher in a
nearby middle school encouraged him to try it again. On the second try, he was
successful.
Investigator: “Who was it that you heard that the connection was working well using the wireless computer lab?”

Participant: “I don’t know his last name, his first name’s [name]. I think he’s at [name] middle school. Yeah, okay, okay. But he said it worked really well, so I thought ‘great’, we’re ready to roll.”

These two examples illustrate that the peer network can play an important enabling role that provides motivation to adopt CT and to try it again if at first a teacher was unsuccessful.

Continuing Education. When asked to describe school district continuing education policies, all but one of the twenty-three participants who were interviewed indicated that their school district was supportive of continuing education. Another indication of this support is that all of the participants were granted permission to attend the CT training seminar where continuing education credits were offered. Teacher preparation or continuing education is an enabling factor that has probably contributed significantly to the advances that have been made thus far in using computer technology in schools. CI registration records from the CT training seminars disclosed that 35% of the teachers who attended the seminars, applied for continuing education units (CEUs) through the University of Colorado.

Specific CT Training. The proximate availability and quality of the training seminars that CI staff provided on how to use the CT curriculum were clearly a factor that enabled adoption. All but one of the participants interviewed indicated that they would not have used CT had it not been for the seminars. Closely associated with this factor were the incentives that were provided to schools for their staff to attend these seminars (i.e., no cost training, reimbursed substitute teacher and travel expenses, free lunch, and CEUs). The following exchange was typical of the responses received.
Investigator: “Do you think you would have used Consider This without attending the training?”

Teacher A: “No.”

Teacher B: “We were just very impressed with the training and that’s really why we decided to do it [use CT].”

Teacher C: “I think it goes back to the e-mail about freeing people to attend training. [an email from a district administrator] ...in that we could get training for a day. It was real big.”

Teacher D: “Without the training I might have gotten a little bit more frustrated and just given up on it.”

Administrator: “What was really appealing was that it was research based, that they [the researchers] were in the process of looking at, that the training was for free, that they were paying for mileage, and that people had an opportunity for credit, and that they were paying for subs. That was huge.... I think some people were pretty inspired from the training.”

The above quotations demonstrate that teacher preparation and teacher and school training attendance incentives were clearly a factor that enabled adoption of CT.

Self-motivation / Determination. Self motivation is a theme that was explicitly stated only once, but it clearly was a precursor to successful implementation of CT. The following quotation is the explicit statement of that theme:

“Because of our firewall, sometimes teachers had technical difficulties, it was hard to get in. So that was frustrating for people. We have proactive people that kinda pushed through that..., but you had to be really self-motivated.”
Information Technology Support. IT support was identified as an enabling factor. The level of support varied considerably from school to school and the quality appeared to be personnel dependent. At the top level of support one teacher reported, “In our school well we have two computer teachers who do computer classes, but then we have a building tech person who just does. right now she’s doing the, she does all the server problems, she does general repair and maintenance of computers.”

The quality of support and the indication that quality is dependent upon the person who is providing it is reflected in the following quotation from the same teacher, who incidentally was the most frequent user of CT statewide during school year 2002-03.

Teacher: “In our school I think we’re supported pretty well, that’s within our school. Now from the district standpoint I don’t know that there is as much support there.”

Investigator: “Why is that different in your school?”

Teacher: “The computer tech person in our school is really good. She really goes out of her way to make sure teachers get what they need to make things work.”

Dialogue with another teacher in the same district revealed that IT support is not always as helpful to teachers as desired.

Teacher: “We have two technology support staff and they wouldn’t help me with it.”

Investigator: “So, what’s their job if they’re not to help the teachers with.....”

Teacher: “Well, they said they would help me if I have a struggle with my
computer, if my computer, cause sometimes it crashes. So they'll come out there if I can't get it recharged. And they'll come out there and help me with that but they wouldn't help me download all that [the plug-ins]."

**Reinforcing Factors.** These factors are the rewards or incentives that strengthen adoption behavior. DOI theory suggests that social support, peer influence, significant others, and explicit reinforcement are all themes that are within the domain of reinforcing factors. The reinforcing factors that are associated with adoption of the *Consider This* curriculum are summarized in Table 5.12.

Table 5.12: Reinforcing Factors Associated with Use of the *Consider This* Tobacco Prevention Curriculum

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<tr>
<th>Reinforcing Factors for Adoption of CT</th>
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<td>• Positive student responses to CT</td>
<td>• CT is convenient for teachers to use</td>
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<td>• CT is convenient for teachers to use</td>
<td>• Respite from student behavior (students are quietly focused on their computers)</td>
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<tr>
<td>• Technical features of CT website engage students in lessons</td>
<td>• Effective classroom management structures</td>
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Positive Student Responses. Teachers reported and the investigator’s classroom observation verified that students were enthusiastic about the interactive features and confidential nature of the CT website. As evidenced in the teacher quotations below, student reactions to CT provided inter- and intra-social system reinforcement needed for teachers to be interested in sustaining use of CT.

"The students liked *Consider This* and at every opportunity were asking to get on the website."
“The kids love it, they’re very positive about it and very excited about doing it because, of course their curriculum is only 9 weeks long and so each 9 weeks there’s a new group of about 50 kids that come in and they’ve heard from the other kids that it’s fun so they’re excited about doing it.”

On face value, it appears that teacher perceptions of student responses to CT were a most important reinforcing determinant for continued use of CT. But upon closer examination of the interview data, it appears that the underlying convenience or ease of lesson preparation that teachers who successfully used CT had was perhaps even more important reinforcing factor.

Convenience. After asking teachers to identify what they liked most about CT, many responded with responses similar to the three that follow.

“I don’t have to come up with the curriculum myself. Uh-huh. It’s educational, that’s pretty much it and it’s easy and the kids love, the kids are very technical in this. They like to do things on the computer whenever I use this website, student discipline is not a problem at all. And that kind of surprised me that students came in, they sat down, they got on the computers and knew what they needed to do, and that was great.”

“Not having to come up with those lessons, those activities for students to be doing…that was one positive thing.”

“I find that when students have a well-designed web or technology curriculum that has intrinsic motivation with it, that discipline problems go down. They stay pretty focused.”
These quotations and comments from two other teachers suggest that CT was a curriculum that required minimal lesson planning was therefore convenient for them to use. The common theme in these comments was that CT is convenient to use. It makes their job easier. (Convenience was also identified as a relative advantage to using CT.)

Respite from Student Behavior. Since students wear headphones and are engaged with the auditory, visual and tactile features of the curriculum, classroom discipline is not a problem. CT is a moderator of student behavior while online and therefore is a factor that reinforces teacher use. Since students are intrinsically motivated and stay focused when using CT, teachers can enjoy a respite from what are ordinarily physically and verbally active students. The above quotations and others suggest that teachers welcome the quiet classroom time that CT offers to them. They do not have to be as vigilant of student classroom behavior and enforce classroom decorum as they ordinarily do.

Technical Features. The technical features of the website that engage students in learning are collectively a factor that reinforces teacher adoption of CT. The audio, video, confidential, self-paced and interactive features add variety to classroom lessons for the student and the teacher. Student feedback and teacher response to the curriculum are factors that reinforce teacher use of the curriculum.

Investigator: “What positive and negative experiences have you had with CT?”

Teacher A: “Obviously it’s the hands-on and they can go at their pace and they can go back and forth. I like the idea that they feel like there’s confidentiality between them and what they’re doing.”
Teacher B: “It’s so different than any other units that we do because there’s so much more to it; there’s games, there’s video, there’s questions that students need to answer. So I think one of the advantages is, it’s really a change of pace for students.”

Teacher C: “One of the positive things is the hands-on material - kids get tired of me lecturing and just going through the book and I think I really like it for that and just the little bit that I’ve talked about it kids have enjoyed it.”

Investigator: “Were there some indications of [student] excitement?”

Teacher: “I mean students ask, who’s on the computer first? ([aside] You know we have first or we have second.) I’m done with my work, can I get on now? They really wanted to finish other work that they were doing so they could get on the computers.”

The compelling graphics, audio, video and other features of CT provide rewards for teachers and students alike and therefore suggest that it is a reinforcing factor.

One DCSD teacher reported what may be a unique resource that reinforced use of the CT curriculum in that school – the presence of a Building Resource Teacher (BRT).

Teacher: “I work with 3 different teams throughout the school year. so when I’m working with those teams I talk to those teachers quite a bit. [name], she’s our school BRT and I talk to her quite a bit just about teaching in general...and so we always say, I’m doing this unit right now and this is what I’m trying to do.”
Investigator: “BRT you said, what is that?”
Teacher: “Our Building Resource Teacher (BRT). She helps to make sure our teachers are up on their training, that the teachers are doing okay, what do we need. So she's helpful in different things.”

This in-school resource was not identified in any other school district. While not explicitly identified as a factor that influenced use of CT, BRTs (or the educator’s educator) appears to have great potential as an enabling factor (continuing education vehicle) that could also reinforce its use. Since BRTs were not universally available and were mentioned by only one teacher, this resource was not identified as a generalized reinforcing factor.

Effective Classroom Management Structure. Given the shortage of computers in nearly all of the schools that were a part of this investigation, teachers had to discover for themselves a classroom management structure that enabled successful implementation of CT. If a successful structure was found, then that discovery reinforced continued use. The following example of how one teacher used 15 computers from a mobile computer lab for a class of 30 students is a case in point.

“The way I had my class set up was I had 15 students on computers and then I had 15 students doing the other activities that came from the website. We got hold of those [the list of supplemental activities provided on the website] and looked through them all and picked 4 or 5 activities that the students were working on. While one group was on the website, and then halfway through class we switched.”

This teacher was the only teacher who disclosed that he had discovered a method for managing his class when there was a shortage of computers. His self-motivation,
resourcefulness or creativity in his pursuit of ways to manage his class resulted in a classroom management structure that reinforced use of CT.

Non-DOI or PRECEDE Emergent Adoption Factors

Barriers. Since each of the theoretical models that were used to develop the initial code book embodied constructs that tended to emphasize identification of factors that supported the theory as though the constructs were assets upon which dissemination efforts could be built, factors that impeded or obstructed adoption of CT are reported separately in this section. These factors could perhaps have been discussed as factors that were the inverse of DOI or PRECEDE theoretical constructs (e.g., relative disadvantages, disabling factors), but for ease of discussion they are grouped here in one category. At the risk of some redundancy, the following discussion focuses on the factors that work against adoption of CT. This obstructionist approach to examining adoption factors is perhaps more consistent with and typical of the problem-oriented public health approach. Designing and building diffusion interventions using the problem-oriented approach consciously acknowledges the obstructions that can impede adoption of innovations and this approach equally important as using DOI and PRECEDE constructs to structure these promotional efforts.

The following account of CI dissemination efforts illustrates this assertion. CI staff offered incentives that addressed relative advantages, and compatibility with teacher values. They also built promotional efforts around known predisposing and enabling factors to attract teachers and school employees to the training seminars. But despite these theoretically sound approaches, they failed to acknowledge and
respond to factors that obstructed adoption of CT. Two of those were the lack of teacher preparation to effectively use technology as an educational tool in the classroom or how to manage Internet programs when bandwidth bottlenecks become a problem. Collectively, all of the factors that obstructed adoption of CT were grouped under the heading Barriers.

The barriers to adoption of the *Consider This* curriculum are summarized in Table 5.13.

Table 5.13: Barriers to Adoption of the *Consider This* Tobacco Prevention Curriculum

| Barriers to Adoption of CT | • Attrition (turnover) of teachers  
|                          | • Discontinued training program for CT  
|                          | • Too few computers  
|                          | • Poor access to the computers that are available in schools (scheduling and restricted use)  
|                          | • Frustration / Lack of IT support on technical problems  
|                          | • Teacher perceptions of low tobacco use prevalence  
|                          | • Social tolerance (indifference) towards tobacco use  
|                          | • Limited school and teacher capacity to combine technical and instructional knowledge in the classroom  
|                          | • Questionable reliability of the CT technology cluster  
|                          | • Communication barriers between health education teachers and IT staff |

Attrition. A systemic barrier to adoption is the attrition or turnover of teachers who were trained to use CT. When attempting to schedule interviews with DCSD staff who attended a CT training seminar, it was discovered that 3 of the 14 staff who had been trained had been reassigned or transferred to other positions within the
district or had left DCSD employment entirely. Loss of approximately 20% of the trained teachers in about 15 months is a significant loss. At this rate of attrition, with no replacement, there would be no trained teachers in five years.

Discontinued Training Program. Closely associated with the attrition barrier is the lack of a sustained training program for CT. If there was a sustained training program those trained teachers who left for positions where they could no longer use CT could be replaced with new trainees. Sustained training is of course dependent on sustained funding.

Too Few Computers. While all of the participants interviewed reported that they had computers available in their school, most reported that there were too few computers for each student in a class to have access to his or her own computer. In some schools, teachers reported having students share a computer (simultaneous use) as they used CT. Shared use of a computer compromises the private or confidential nature of this interactive curriculum for the student, where sensitive questions about cigarette use are asked. Students might be influenced to answer CT program questions to satisfy what they believe the student who is sharing the computer might want to see. Sharing the computer also eliminates the auditory portion of the program and the tactile aspects of the curriculum for the students who are observing. Sharing a computer eliminates two of three learning style approaches. Losing the auditory and tactile mechanisms of CT diminishes the appeal of the CT program to students, compromises program fidelity, and probably the potential effectiveness of the curriculum.

Poor Access to Computers. Not having access to enough computers for each student in a class to have their own and not having computers readily available (e.g.,
easy scheduling of the lab) are significant barriers to adoption of CT. The following quotations provide the evidence for these assertions.

Investigator: “What are some of the barriers to using CT?”
Teacher A: “We haven’t been able to get into the computer room and we share it with the high school and other middle schools …”
Teacher B: “Our problem is scheduling, we’re such a small school that our problem is scheduling, to be able to get in there [the computer lab].”

Frustration / Lack of IT Support. While IT support was identified as an enabling factor that encourages use, at the other end of the IT support spectrum, lack of IT support is a significant barrier to adoption of CT. A second teacher in the same school district where a teacher reported that his IT support was “really good” reported her total lack of IT support:

Investigator: “So you didn’t have enough computers for an entire class. Is that right?”
Teacher: “Yes, I didn’t have enough computers for any one of my classes, for them to all be in there. And then I thought well, I could have them doing other things while half are maybe on the computer, but then it got to the point of downloading all that information on there.”
Investigator: “And the technology staff there couldn’t do that for you?”
Teacher: “No, I would have had to do that all on my own.”
Investigator: “Okay.”
Teacher: “So that was very frustrating for me.”
This teacher expressed the sentiments of many teachers who were unsuccessful in either trying to use or sustaining use of CT when she said that the lack of computers and having no IT support was “frustrating.” This quotation did not require interpretation or an effort to distill its meaning. Her frustration was not only clearly evident from her words, but also from the emotional rise in her voice. This quotation disclosed frustration with getting the technology to function as intended was a significant, although not always articulated, theme that was a barrier to adoption among many of the teachers interviewed. Adequate IT support could have mitigated this frustration.

Tobacco use prevalence was acknowledged as being generally very low in the middle school population. It is possible that this perceived low prevalence may have had a subtle negative influence on adoption.

“We’re not having too much of a problem with cigarette smoking here at our school.”

“Not many kids smoke cigarettes from what you can see.”

There was however, no textual evidence from these interviews to support this hypothesis and no probing questions were asked about it. It is a hypothesis that could be tested in future studies.

Social Tolerance of Tobacco Use. While there is a state law requiring schools to be tobacco-free (no tobacco in any buildings, on school grounds, or at school-sponsored events), some schools still tolerate tobacco use, in violation of that law. Two rural school participants reported that parents smoke outside of school-sponsored sports events.
"At football games people smoke outside by their cars and they don't have anybody running around telling them they can't, even though there are signs all over the place and people leave the gym for a basketball game and go outside and smoke."

Indifference towards tobacco use as a community public health problem is tantamount to passive encouragement.

Limited School and Teacher Capacity. The potential influence of community and school district tobacco control policies, continuing education policies, and Colorado Teacher Certification Standard Seven (Knowledge of Technology) on adoption of CT and other technology-driven curricula has not been fully realized. It appears that school and teacher capacity to apply technology in the educational environment was inadequate for effective adoption of CT. Capacity in the classroom domain requires an interface of the technical and instructional domains. The instructional domain requires human knowledge and skills in combination with the physical hardware and software needed to support computer-based learning. In other words, capacity is the embodiment of human and hardware resources needed for effective student learning through technology. However it is defined, the lack of capacity is a barrier to adoption.

Questionable Reliability of the Technology. The questionable reliability of the CT technology cluster is an important and pervasive barrier that impedes adoption. The following quotation addresses this concern. Note that in the closing phrase the study participant uses the word "rely."

Investigator: "What are some of the advantages to non-technology curriculums?"
Teacher: "There's a little more, I want to say flexibility, in standard curriculums. ...Um, I guess, I mean, I guess there's a little more flexibility when you're using some of the other programs (non-technology programs), you don't have to rely on the technology."

Teachers need to know that a lesson which is planned will be delivered as planned. As observed in the CT classroom, students can become disquieted and perhaps unruly if lessons do not go as planned. Teachers want convenient and reliable curricula that are easy to access with readily available tools for implementation and maintenance.

It is important to note that when the teacher, quoted immediately above, was referring to "the technology," he was combining the CT program and the Internet as one entity. Once again, the concept of a "technology cluster" arises. Determining the boundaries around a technology or where one technology ends and another begins is an intractable problem. The above quotation illustrates how the boundaries between CT and the Internet were blurred. Barriers impeding adoption of CT could arise when any element of the "technology" fails. Consequently, CT is dependent on the performance of what Rogers calls a technology cluster. He defines the hardware in a technology cluster as "a tool that embodies the technology as a material or physical object" (1995, p. 235). In this case, the hardware is the Internet and the reliability of its software interface (Internet service providers, telephone, cable and satellite connections), are all important factors that influence perceived reliability of the Consider This software. Consequently, this intertwined, highly dependent relationship between the hardware and software determine the perceived reliability of CT. Yet, the hardware and the hardware interface are independent variables (public utilities) that are outside of the control of the developers/innovators of the software.
Communication Barriers. Communication barriers between health education teachers and IT or keyboarding teachers appear to obstruct optimal student access to computers in some schools. This barrier was so pervasive that it even influenced access in a school where there was an adequate number of computers for an entire class. Some computer or keyboard teachers appear to have taken a position or imposed a policy that the computer lab is their domain and that it needs to be protected from use other than technical computer instruction or keyboarding. These positions or unwritten policies, while probably intended to protect the operation of computers for IT or keyboarding classes, have alienated some health education teachers who want to use the computer labs for instructional purposes with curricula like CT. Since the IT teachers have positional and proximate authority over the computer labs, some health teachers have not been able to access computers for their classes and felt powerless to influence these restrictive policies.

The following brief case history offers another bit of evidence supporting the hypothesis that communication barriers exist between IT and health education staff in some schools. One study participant, a young health teacher who expressed confidence in her ability to use computers, was not aware of the security firewall that was operational on her school’s computer network. She tried for over two hours to download the plug-ins necessary to operate CT. Despite her great frustration she did not pursue technical assistance from the school IT staff person because she either felt estranged from or had never built a relationship with the IT support person. Based on this and other teacher interviews, teacher reluctance to ask for IT staff assistance may also have resulted in part from the compartmentalized structure of schools (i.e., health education team, social studies team, IT team). Based on the interviews
and the lack of data that indicated an interaction, IT staff and health teachers do not routinely communicate. When they do communicate, the language of their respective professions differs enough that communications may not always be effective. Unwritten policies (firewall requirements) and communication and organization barriers like these appear to have created environments where IT was difficult to integrate with health education instructional activities.

While communications problems between IT staff and some health education teachers have resulted in underutilization and adoption of CT, if there were a sufficient number of computers in the schools, providing broader availability, this would not be a problem.

Age Barrier. The only demographic factor that was mentioned by study participants as a barrier to adoption of CT was age and this factor was mentioned by only one health education teacher.

"Some of us older people here in our 50's (and we're trying to learn it) we probably half of us probably don't use all the facilities that the computer has to offer."

Census data suggest that age may be a significant and valid barrier. Sixty-nine percent of persons ages 9-17 use the Internet (a marker for computer use) compared to 37% of persons older than 50 years of age (US Census, 2001). Data from a study conducted by the U.S. Department of Education found that teachers with fewer years of teaching experience were more likely to feel prepared to use computers or the Internet than their more experienced colleagues (USDOE, 1999). This inverse correlation between Internet use and age is probably due to a generational effect and the data from this study suggest that age is not universally influential on use of CT.
The data do suggest however, that there is a tendency for older teachers to be less comfortable with using computers for instructional purposes and for students to be more comfortable with computer technology than teachers.

**Attitudes.** Teacher's personal attitudes about their jobs and/or computer technology appear to influence adoption of CT. The following attitudes were either mentioned specifically or were inferred from the text of the interviews: apathy about one’s job; comfort with computer technology; confidence in one’s ability to successfully use CT; and motivation to change or adopt a new curriculum that is technology-based (i.e., try CT and persist if problems arise).

Apathy. One teacher offered his opinions regarding barriers to dissemination of the CT website in the following dialogue.

Investigator: "Did other teachers in your school use CT?"
Teacher: "There wasn’t a whole lot of really requests to do formal in-service for it, so we didn’t go ahead with it."
Investigator: "Why would you say that is?"
Teacher: "Apathy. Apathy."
Investigator: "Is it apathy about teaching in general or about web-based curricula?"
Teacher: "I think it was just something new added to the curricula for a bunch of people who were pretty happy with what they were doing."

This teacher’s response suggests that change (using a new curriculum) and the extra effort that is associated with it may encounter apathy or indifference as a barrier. Therefore, promotional efforts that outreach to and encourage teachers to adopt CT must be done using methods that excite and motivate teachers to try it in their classrooms.
Comfort. Comfort with computer technology was disclosed in the survey portion of this study as a factor that influenced adoption of CT and the text of interviews in this qualitative portion of the study reinforce that finding. One of the few study participants who held an administrative position observed that “Adoption really depends on how comfortable teachers are with technology, and change.”

Teacher characteristics identified in this study, such as knowledge, skills, experience, and confidence in using computer technology can be combined to form a broad construct, “comfort.” The comfort construct or theme was a significant factor in the adoption rate of CT. Teachers who were “comfortable” with computer technology were more willing to try CT and more willing to persevere (including reaching out for technical assistance) to resolve those problems.

Self-motivation. Since CT is not a required course in any Colorado school, teachers must be self-motivated to learn how to use this approach and then to implement it in their classrooms. There was no performance accountability system in place in any school or school district that explicitly required that a teacher use CT. While there were many policies that predisposed or enabled teacher use of CT, none of the study participants disclosed that a school or school district policy required CT use.

Capacity. Capacity is defined as “innate potential for growth, development, or accomplishment.” (Dictionary, March 2004) In this study, capacity was an emergent construct that refers to the potential to grow, develop, and accomplish advances in use of computer technology. It could be defined more specifically as the combined resources of teacher attitudes towards their profession, instructional and technical knowledge and skills in the use of computer technology and the availability of
and access to computer hardware. This convergence of two previously identified factors (instructional knowledge / skills and availability/access to computers) into one construct, “capacity,” emphasizes how indistinct these factors really are. The collective human resource (school administrators, principals, health teachers and IT support staff and teachers) was the foundation upon which adoption of new technology was built. However, without adequate availability of and access to computer hardware, this knowledge was not effectively realized or applied in many classrooms. This collective human resource is categorized here (correctly or incorrectly) as an attitude.

**Critical Mass.** Rogers asserts that *critical mass* occurs at the point at which enough individuals have adopted an innovation so that the innovation’s further rate of adoption becomes self-sustaining. (Rogers E. p. 313) The promise of a critical mass was very great within the DCSD since fourteen staff were trained to use CT. However, it appears that failure of the development of an effective, sustained diffusion network, impeded use of CT beyond those who were trained. The failure of the development of a critical mass was due to a number of factors: attrition or turnover of trained personnel; lack of sustained CT training initiative; insufficient, onsite IT support for teachers who were not comfortable with computer technology; and lack of sustained, effective outreach efforts by CT project staff that capitalized on school diffusion networks.
Summary of Qualitative Findings

Classroom Observation

The findings from the classroom observation where CT was being used by 30 seventh grade students were as follows.

- Students were captivated by the CT program once they were logged on and the headphones in place. The audio, video and interactive functionality actively engaged them in the tobacco use prevention and education lessons. While logged-on to CT, students were quiet and still except for eye movement across the computer screen and hand movements to manipulate the mouse.
- Student comments suggested that the content was new and informative and that they liked the tailoring and privacy features of CT.
- While the teacher of the observed class demonstrated exceptional classroom management skills in the computer lab, classroom management for teachers less comfortable with computer technology would most likely be challenging.
- Teacher and student frustration was evident when technology problems arose. These problems and the associated frustration are likely barriers to continued implementation.

Participant Interviews

Relative Advantages. The study participant interviews disclosed that the relative advantages over presently used tobacco education curricula were:
• CT provides up-to-date information;
• The online, interactive delivery method of CT is appealing to students and teachers and the teachers liked the modular lesson structure;
• Teachers liked that students could learn at their own pace and that it appeals to multiple learning styles;
• Teachers indicated that CT was convenient (i.e., lesson planning was minimal, curriculum was free and readily accessible).

Compatibility Factors. Compatibility factors identified in the interviews included:

• CT (as do other tobacco prevention curricula) was compatible with school community athletic values;
• Teachers valued the hands-on or tactile aspect of CT;
• CT was compatible with teacher interests in and willingness to role model nonsmoking behavior;
• The training seminars offered by CT innovators (change agents) are consistent with teacher, school district and state support for continuing education.

Complexity Factors. The complexity of CT was acknowledged as easy to use by those teachers who successfully logged-on and used it in their classrooms. However, those teachers who were not successful at logging-on defined complexity through expressions or terms that are reflective of the technological nature of the curriculum. Those terms include terms that are not used commonly by teachers—firewalls, downloading, bandwidth, browser, etc. These terms reflected the complexity of CT, especially for those teachers who were unsuccessful downloading
the plug-ins, the first step in using CT. These terms were often expressed with a real strong sense of frustration. Their frustration was not necessarily with CT but with the technology cluster (Internet, ISP, Internet connection, computer) that encompasses the realm of CT.

Complexity is defined as a function of teacher knowledge of and comfort with technology and their determination to find solutions to technology barriers.

Observability. While CT is available for free on the Internet, its observability once it is operational is very limited. Isolation of school computer labs from other classrooms limits the observability of CT within a school and since a relatively small number of students access it at any given time, the word-of-mouth or communication network or “buzz” needed to create demand is also restricted. Isolation of one school from another prohibits the observation of successful classroom experiences. Social networks between schools appear to be nearly non-existent between schools, especially among schools in different school districts.

Research outcomes on CT have not been reported so outcome observations have not been available to validate its effectiveness. Having outcome data is especially important in school environments where proven effective curricula are the only curricula that some schools will permit. The National Training Partnership, an organization launched in 1996 with support from the Centers for Disease Control and Prevention has a list of proven effective tobacco education curricula and CT is not on this list. This further inhibits its observability. (National Training Partnership, 2004)

Social System Member Characteristics. Persons in administrative positions (school principals and district administrators) influenced adoption of CT by asserting positional authority and requiring that teachers attend a CT training seminar or by
granting permission for teachers to attend. In the case of the DCSD, an administrator decided that that district would have all of its health education teachers trained to use CT. This person was an early adopter and by virtue of her position was an opinion leader.

Opinion leaders who are in positions of authority can also influence adoption informally by sharing their experiences and solutions to technical problems encountered when moving towards implementation.

In DCSD a critical mass of teachers who were using CT was created by the training of fourteen school district personnel. However, other factors that could have increased the rate of adoption and rendered CT self-sustaining were not influential. One of those factors was the social network. It was not strong enough to build a critical mass.

Predisposing Factors. School district policies on health education and tobacco use, state and local laws that discourage sale and possession of tobacco, state standards for teacher certification and teacher interest in and pursuit of alternative instructional methods were the key predisposing factors that provided the rationale or motivation for use of CT and for tobacco use prevention curricula in general.

Enabling Factors. Computer availability and accessibility, teacher knowledge of and skill with computer technology, access to peer networks, support for continuing education, specific CT training, teacher self-motivation, and information technology support were all factors that enabled implementation of CT to take place in schools.

Reinforcing Factors. The factors that reinforced use of CT were: positive student responses to CT; its convenience for teacher use; it provides a respite for
teachers (student behavior is moderated); teachers observe that students are actively engaged in the lessons; and, an effective teacher-employed classroom management structure. If an effective means of classroom delivery of the CT curriculum is identified by teachers (e.g., wireless computer lab, when computers are limited assign students in shifts on the computers) they are more likely to continue using it in the classroom.

Barriers. The factors that impeded adoption or dissemination of CT were attrition (turnover) of teachers, lack of a sustained training program for CT to replace those who discontinued use, too few computers available for entire classes to use, poor access to the computers that are available in schools (scheduling and restricted use), frustration with technical problems, social tolerance of tobacco use, limited school and teacher capacity to apply instructional knowledge in the technical environment, questionable reliability of the CT technology cluster, communication barriers between health education teachers and IT staff and age of the health education teacher.

Attitudes. Teacher attitudes toward technology, teaching and CT influenced the frequency of CT use. The specific attitudes that were identified has having influence on use were apathy (indifference or readiness to change), comfort with technology, and teacher self-motivation to resolve technical problems encountered while trying or using CT.
Conclusion

The findings from the classroom observation and the participant interviews summarized at the close of this chapter are factors that promoted or impeded adoption of CT. They were not disclosed statistically in the survey findings. While the adoption factors identified in this chapter are specific to the CT curriculum, they provide clues to diffusion of Internet-based health education curricula. Further investigations into diffusion of this type of technology and the adoption factors identified here will help advance use of Internet-based curricula in school classrooms and specifically serve to verify the validity and reliability of these adoption factors.
CHAPTER 6
DISCUSSION

The effort that went into the dissemination of CT in Colorado schools was well-planned and for a brief time resource intensive. The findings from this study validated the dissemination strategies used by CT dissemination project staff. For example, CT project staff offered system incentives to schools (e.g., reimbursed substitute teacher and travel expenses) and personal incentives to school staff (e.g., continuing education credits) in order to attract attendance at training seminars. They offered and, when requested, provided follow-up technical assistance to teachers who had operational problems with CT. On the other hand, the incentives provided and the follow-up offered did not assure that CT was utilized to its fullest extent.

The incentives were useful in attracting teachers and other school personnel to attend the training seminars, but did not assure classroom implementation. Building a more effective bridge from dissemination (promotion and training) to adoption (classroom use) through maintenance (sustained use) could have improved the rate of CT adoption. While the evidence of substantial teacher enrollment in CT training seminars suggests that dissemination barriers were overcome, the bridge between dissemination and adoption needed to more effectively acknowledge and address barriers or obstructions to adoption. In retrospect, the offer of technical assistance made by CT project staff was too passive a strategy to be effective. Many teachers simply tried to log-on, encountered a technical problem, and never tried it again. A proactive, individualized follow-up plan that contacted trained teachers in their
schools after they had tried CT in their own school would very likely have increased utilization.

Three conclusions that Rogers made in a study of family planning adopters are relevant here:

1) Incentives increase the rate of adoption of an innovation;
2) Although incentives increase the quantity of adopters of an innovation, the quality of adoption decisions may have been relatively low, limiting the intended consequences of adoption; and
3) Adopter incentives lead to adoption of an innovation by individuals different from those who would otherwise adopt” (Rogers, 1995).

In this study, there was evidence to suggest that the incentives to adopt CT attracted teachers and school systems that would not otherwise have been able to afford the cost of a full-day training seminar. Conversely, for some of the teachers who attended the CT training seminars, the close proximity to home or school and the continuing education credits may have been the primary reasons for their interest in CT. These teachers may not have been actively contemplating a change in their tobacco education curriculum when they registered for the training seminar, signifying that they were not ready to actively take steps to change after the training seminar. A proactive follow-up effort where teachers who were trained to use CT were contacted in their schools (telephone and/or personal visit) may have moved some of these teachers along the DOI decision continuum closer to the adoption, implementation and maintenance stages.

The assets-based approach that relied exclusively on DOI or PRECEDE constructs to design and implement the CT dissemination effort may have blinded
CT project staff to the need to address potential barriers (liabilities) to adoption and implementation. Theoretically sound assets-based strategies were used exclusively in the design of the CT dissemination plan. Rogers’ adoption characteristics (i.e., relative advantage, compatibility, etc.) were used to guide development of the promotional and marketing (dissemination) efforts to attract teachers to the training seminars. These adoption characteristics were used by CT project staff during the training seminars to encourage use of CT. The complexity of the curriculum and the anticipated technology cluster barriers were also described to training seminar attendees. However, these barriers to adoption were not adequately accounted for with an active outreach strategy after the CT training seminars.

An unrecognized risk of building a dissemination plan built exclusively on assets-based constructs, from models like DOI and PRECEDE, was that the significance of counter-adoption factors (barriers or liabilities) related to diffusion were not sufficiently addressed. CT project staff invested their plan exclusively in the assets that are embodied in these theoretical constructs, subconsciously anticipating that addressing these factors would compensate for known technology barriers to adoption and implementation of CT (e.g., inadequate network bandwidth to run CT, bandwidth bottlenecks, etc.). Had adequate time and resources been available to CT staff, a pilot-test training seminar with follow-up to a small group of teachers would likely have disclosed the individual and system barriers that impeded classroom adoption and identified methods for managing these problems. For example, the consequences of not being able to download plug-ins needed to run CT could have been observed and a plan for circumventing this barrier developed and implemented.
Assets-based approaches using DOI and PRECEDE constructs can however provide guidance for the development of effective diffusion strategies if barriers (liabilities) are acknowledged and factored into dissemination plans.

Diffusion of Innovations Adoption Characteristics

Relative Advantages

Other than the up-to-date information (content) provided by CT, the principal advantages to the CT curriculum identified by interview participants related to the unique aspects that were a product of the technology. The online, interactive delivery method, the student's ability to learn at their own pace, and the convenience of minimal lesson planning were all factors that were a product of the CT technology cluster. The CT curriculum is a student-centered educational experience that is focused on the individual learner not on the teacher's presentation of material. By removing the focus from the teacher, CT provides an educational experience that is tailored to the needs and interests of the student, easier for the teacher to deliver and compatible with teacher and school district interests in student-centered learning.

Compatibility Factors

By virtue of its anti-tobacco use mission, CT is compatible with schools that value athletic performance and with non-smoking teacher interests and willingness to be good role models for students. These factors however, do not make it unique from any other tobacco use prevention curriculum. The compatibility factors that
are perhaps more uniquely related to CT are the tactile or hands-on feature of the curriculum. The student-centered approach that appeals to multiple learning styles was an important feature that attracted teacher attention and support for CT. The interviews with teachers suggested that they wanted to be assured that they left no student behind in the learning process. Thus, the appeal to multiple learning styles was compatible with teacher values.

Since CT was introduced in Colorado with an opportunity for continuing education credits, it appealed to teacher and school district interests and needs for continuing education credits and the intrinsic interests of educators to sustain their personal learning.

On the negative side of the compatibility equation, CT was often incompatible with teacher knowledge of and comfort with technology and school and school district technical capacity. The speed with which information could be transmitted across the Internet lines was a barrier with which even the most computer literate teachers struggled. If teachers were able to overcome the technical problems they encountered when using CT, then they perceived CT to be compatible with their interests and were successful to varying degrees with implementation, adoption and maintenance of CT.

**Complexity Factors**

Complexity was associated with success in using CT. It was also a factor that was entangled with the technology cluster. Teacher perceptions of CT's complexity were universally associated with the technology that was used to transmit it to the classroom, not necessarily the CT program itself. Statements regarding complexity
nearly all mentioned problems downloading software (plug-ins) from the Internet, bandwidth problems, browser related issues, etc. There was a general inability to separate the CT program from the technology used to deliver it to the classroom. Frustration was the most frequently used adverb when describing the complexity of CT. The frustration of getting CT to function properly on school Internet connections that were often compromised by bandwidth bottlenecks prevented many teachers from advancing from the temporary user category to the trial user and adopter categories.

While the complexity of this technology cluster (downloading plug-ins, bandwidth problems, etc.) prevented many teachers from adopting CT, those teachers who used CT successfully indicated that the program was easy to use.

**Trialability Factors**

*Consider This* is accessible on the World Wide Web, therefore, in the strictest definition of trialability, anyone with access to the Internet can try it. On the CT home page there is a hyperlinked text box entitled “Thinking about using *Consider This* in your classroom? DEMO.” This portal to a CT demonstration and frequently asked questions page makes it easy for teachers to discover the advantages to using CT. This Web page also describes why this type of education is important, how the CT site provides personalized information, what types of things students will be doing, and how to integrate the curriculum into the classroom. Also on the home page is a button that opens to the registration page for teachers. All of these features make it fundamentally easy for teachers to try CT before actual implementation in their classrooms.
The incentives offered to Colorado teachers and school districts extended the trialability to teachers by providing educational training seminars throughout the state. These incentives however, may have attracted teachers and other educators who were not necessarily contemplating a change in their tobacco education curriculum, who attended simply because it was close to home or school, or who were just looking for a way to accumulate state-required continuing education credits.

Making it easy to register and attend the training seminars may have optimized trialability for teachers, but the concept of trialability needed to be extended beyond the training seminars to the classroom environment. Follow-up technical assistance using outreach strategies would likely have increased trialability among the 40% of the teachers who never tried CT once they returned to their schools.

**Observability Factors**

Observability, or the degree to which the results are observable, was limited by the limited peer interaction within teacher communication networks and long-term student outcome (smoking uptake) that was not readily observable. In small participating school districts where there were only one or two middle schools, little enthusiasm was generated about CT. There were also relatively few health teachers for the critical mass needed to support an effective communications or social network to promote observability. School computer labs are isolated from other classrooms and one school from another, inhibiting observability. The complexity of the technical language associated with Web-based programs was relatively new to teachers, creating a communications barrier that impeded observability.
Communication Networks

The survey or quantitative portion of this study disclosed that school diffusion or communication networks were very effective in disseminating knowledge of CT, but the interviews disclosed that these networks less effective in promoting implementation or adoption. There was no evidence of intra-school district communications after the training seminars and little evidence of inter-school district communications about CT.

The CT promotional brochure announcing the training seminars created a “buzz” in schools where more teachers heard about CT through their network than actually saw the promotional brochure. The survey data provided evidence suggesting that the buzz may actually have been more about the incentives offered to attend the training than the CT curriculum itself.

School communication networks to deliver information about CT were largely ineffective. Had an effective, post-training communication and technical assistance network been active, teachers like those who encountered firewalls as the defining barrier to CT access, would more likely have been able to obtain peer assistance in resolving this barrier. Teachers who were unable to find ways to manage bandwidth bottleneck problems that caused computers to lock up would have heard from those teachers who had found solutions.

While the incentives were successful in activating school personnel communication networks, creating knowledge of CT, attracting teachers to the training seminars and to trying CT curriculum, there is little evidence to suggest that they motivated broad adoption, implementation and maintenance of CT. CT project staff may have failed to capitalize on the potential of communication networks by
doing such things as creating a follow-up list serve where teachers could share their adoption and implementation experiences or actively contacting teachers and/or providing technical assistance visits after the training seminars.

Building on the communication networks that were opened through the CT training seminars could have paid dividends of increased diffusion of the CT curriculum.

Critical Mass

CT did not become self-sustaining in part because a critical mass of teachers who adopted and implemented CT was not achieved. A critical mass was not attained because there were too many barriers to utilization, especially for those teachers who did not persist in finding solutions to technical barriers. Many teachers had to resolve technology problems by themselves or at least felt that they had to do this.

Teacher unwillingness to seek technical assistance may at least in part been due to their reluctance to admit that they were having problems using this technology. Pro-innovation biases imply that knowledge of the technology is necessary for advancement in this profession. To admit short-comings with knowledge of and success with this technology may have impeded the development of the critical mass of teachers needed for CT to be broadly adopted. Teachers had little or no reinforcement for use of CT among their peers, a factor that could have contributed to the development of a critical mass.

Innovation Development

The Consider This curriculum was developed using proven effective strategies for tobacco use prevention and education and instructional designer and educator
input. The innovators knew that this innovation was on the leading edge of the computer technological capacity of many schools, yet developed this curriculum to advance instructional classroom technology in health education. CT bandwidth and computer requirements were more advanced than the capability of some schools and school computer networks and it required more knowledge of computer technology than many teachers possessed. The innovators of CT, at least subconsciously, may have hoped that pro-innovation biases and the high educational level of teachers would motivate or challenge educators to prevail over technology gaps. While many teachers rose to this challenge many more simply abandoned use of CT when they encountered problems that required an additional investment of their time.

Dissemination

After more than five hundred mailings and targeted phone calls to selected school personnel, 147 Colorado educators received training on how to access and use CT. This evidence that suggests that dissemination efforts and the resultant knowledge of CT was at least moderately successful. This success did not however result in adoption. Forty percent of this population never tried CT in their classrooms and therefore did not advance to the adoption stage.

Adoption

Sixty percent of the educators trained to use CT adopted it at least briefly. The adoption decision was defined as having tried it in at least one or a few classes. Sixty percent of the teachers trained to use CT were identified with this group. One third of
this group of teachers failed to advance to the next stage in the diffusion process. These teachers were successful at downloading the plug-ins, had adequate access to computers in their school, had tried CT but were frustrated enough by bandwidth, computer lab scheduling difficulties and the extra time it took to initially set up the computers that they did not try it for very long.

**Implementation**

Thirty-nine percent of the teachers implemented CT (used it for multiple class periods for one or two class groups) in the classroom. Approximately half of this group (21% of all trained teachers) who implemented CT, did not advance to the confirmation stage. These teachers, the temporary users, had resolved or successfully downloaded the plug-ins required to run CT, learned to manage bandwidth problems and had adequate access to computers in their schools, but did not advance to the confirmation or maintenance stage. Comments from the interview data suggest that the failure to sustain or maintain use were due to continued difficulties in gaining adequate computer lab time for their classes and persistent bandwidth problems.

**Maintenance**

Approximately 1 teacher in 6 (17.5%) surveyed indicated that they had use CT for three or more class groups. This group (adopters) demonstrated that they had confirmed use of CT and were in a maintenance mode. These teachers had successfully downloaded the plug-ins, had adequate access to computers, had good IT support in their school, successfully managed the bandwidth problems, overcame the frustrations associated with using CT and developed a classroom management
structure that was satisfactory for students and teachers. They had sustained use of
the innovation, had overcome implementation barriers that precluded or impeded
use of the curriculum, and had confirmed its relative advantages, overcome its
complexity, observed its value, and concluded that it was compatible with their
teaching style and values. This group was perhaps the most ready to make a change
in their tobacco education curriculum.

This quantitative characterization of the Stages of Diffusion must however,
be qualified since it represents a simple cross-sectional view of diffusion. It does not
account for decisions to continue adoption, adopt CT at a later time, discontinue use or
continue rejection. Each of these decision points could change the diffusion outcomes
for CT as time passes from the date of initial dissemination. It is however, most likely
that without reinforced dissemination efforts and updating of curriculum content, CT
will not become widely implemented and maintained in Colorado schools.

PRECEDE Adoption Characteristics

Predisposing Factors

Laws, policies and teacher certification standards established the rationale
or motivation for implementation of tobacco education curricula like CT. These
statements of community or societal rules and values guide the actions of school
district administrators and teachers as they pursue the fulfillment of the professional
responsibilities to which they are entrusted. As part of these responsibilities, this
study disclosed that teachers are always in pursuit of better or alternative methods for
conveying the educational materials that they are expected to provide for students. CT offered and provided an alternative means for delivery of tobacco use prevention education material that was satisfying to teachers and students.

**Enabling Factors**

Human and physical resources allowed the motivation for delivery of the online CT curriculum to be realized. Strengths and weaknesses in this resource pool were responsible for the adoption or rejection of the CT curriculum. Those strengths and weaknesses were largely in the human resource domain, with the exception of limited computer availability and bandwidth connectivity, resources that were in the physical or technical domain. The human resources that influenced adoption included teacher knowledge, skill and comfort with computer technology, access to peer networks that supported adoption, teacher and school support for continuing education, training availability for CT, teacher motivation and determination, and availability of information technology support.

**Reinforcing Factors**

Those factors that rewarded or provided continued incentives for implementation of CT after it was adopted by teachers reinforce its use. If an effective classroom management structure that compensated for the shortage of and limited access to computers, and the questionable reliability of the CT technology cluster was discovered by teachers then teachers who were able to successfully access CT were likely to continue using it. They were likely to continue use because students liked the CT program and teachers observed that students were actively
engaged in CT lessons since it appealed to multiple learning styles. An added benefit to teachers was that while CT was being used by students the classroom, usual middle school student behavior was moderated. They were quiet and focused on the computer screen, thus providing teachers with a respite from the usual noisy and active middle school classroom.

Emergent Adoption Characteristics

Through the analysis of the survey, observational and interview data barriers to adoption, implementation and maintenance of CT emerged. These factors were reported outside of theoretical contexts because the assets-based approach of both DOI and PRECEDE constructs does not specifically reference those factors that could be liabilities in the adoption equation. Adoption (A)/ Implementation (I)/ Maintenance (M) of CT is a function of school human and technical assets and liabilities (barriers) + the resources of the change agent. This relationship is represented mathematically by the following simple equation:

\[
AIM = f(\text{school assets } + \text{ liabilities}) + (\text{amount and duration of change agent assets } + \text{ liabilities})
\]

While this equation is an over-simplification of a complex interaction of human and physical resources it demonstrates the interchange of the school and the change agent (CT project staff).

School and change agent assets were described previously in this chapter under the headings of DOI and PRECEDE Adoption Characteristics. The school and change agent liabilities are discussed here.
Attrition or turnover of teachers who were trained to use CT emerged on the liability side of the adoption equation. While this barrier to adoption is a naturally occurring event in any employment environment, loss of teachers to employment changes was not accounted for in the implementation plans of the change agent. This lack of planning for these events was due in part to the nature of the one-year grant that funded dissemination of CT in Colorado schools and the resultant lack of resources for sustained training activity.

Too few computers and limited access to computers are similar but unique problems. Too few computers is a function of school resources. As mentioned in an earlier chapter, Colorado schools have a student to computer ratio that is better than the U.S. ratio, but schools in general do not have enough computers for each student to have full-time access to one. Management of access to computers that are presently available is perhaps a factor that can be improved. Access to computers in Colorado middle schools is managed by an IT staff person or keyboarding or computer teacher. Access to computers appears to be dependent on the management structure that is established by these individuals, some of whom are perhaps overly controlling and protective of the hardware in their computer labs. These computer teachers establish scheduling systems that restrict or limit use of the computer lab. Other school computer personnel have established management systems that appear to be satisfactory to teachers who desire use of the computer lab.

Technical problems associated with the CT technology cluster often result in frustration among teachers who are less skilled or comfortable with technology. These problems are compounded when a school does not have adequate or responsive IT support or when the change agent does not provide proactive, sustained technical support after initial training on use of the technology.
Social tolerance of tobacco use in the community may be an underlying barrier to effective adoption of CT. The degree to which a community tolerates tobacco use may influence the vigor with which teachers pursue adoption of tobacco use prevention curricula.

Limited school and teacher capacity to implement a technology-based curriculum is a bundled combination of environmental and human resource barriers that includes knowledge of the technical and instructional aspects of how to use online curricula in the educational/classroom setting and the availability and accessibility of computers in schools. Data from the study suggest that capacity to use computer technology in the classroom will increase as computers are available and easier to access.

Perhaps one of the most important barriers to adoption of CT is the questionable reliability of the CT technology cluster. The CT program itself had been running successfully for 2-3 years prior to this study, so any problems that were encountered with the technology were with the technology that supported the operation of the program (i.e., the Internet connection). The static variables in the support configuration included the Internet service provider, the school computer server, the school district's network or the bandwidth capacity of the Internet connection. The dynamic variables included the amount of traffic that was on the school Internet connection at any given time, and the CT page that the class is on at the time problems are encountered. If a class arrives simultaneously at a page that demands high bandwidth, then the computers are at risk of locking-up or of disconnecting from the Internet.
### Synthesis of Findings

Table 6.1 combines the major findings of this quantitative and qualitative study by each of the guiding theoretical models and the factors that emerged that were outside of the literal interpretation of the DOI and PRECEDE constructs.

Table 6.1: Factors that Contribute to Adoption, Implementation and Maintenance of the Consider This Curriculum

<table>
<thead>
<tr>
<th>Diffusion of Innovations Factors</th>
<th>PRECEDE Model Factors</th>
<th>Non-DOI or PRECEDE Emergent Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication networks</strong></td>
<td><strong>Predisposing Factors</strong></td>
<td><strong>Barrier Factors</strong></td>
</tr>
<tr>
<td>In-school; and intra-district.</td>
<td>1) School district policies on health education and tobacco use;</td>
<td>1) Attrition (turnover) of teachers;</td>
</tr>
<tr>
<td></td>
<td>2) State and local laws that discourage sale to and possession of tobacco by youth;</td>
<td>2) Discontinued training program for CT;</td>
</tr>
<tr>
<td></td>
<td>3) State standards for teacher certification;</td>
<td>3) Too few computers;</td>
</tr>
<tr>
<td></td>
<td>4) Teacher interest in CT as an alternative instructional method.</td>
<td>4) Poor access to the computers in schools (scheduling and restricted use);</td>
</tr>
</tbody>
</table>

5) Frustration / lack of IT support on technical problems;

6) Social tolerance (indifference) towards tobacco use;

7) Limited school and teacher capacity to combine technical and instructional knowledge in the classroom;

8) Questionable reliability of the CT technology cluster;

9) Communication barriers between health education teachers and IT staff;

10) Teachers 50 years old and older may not be inclined to use CT.
Table 6.1 (Continued)

<table>
<thead>
<tr>
<th>Diffusion of Innovations Factors</th>
<th>PRECEDE Model Factors</th>
<th>Non-DOI or PRECEDE Emergent Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentives to be trained on use of CT</td>
<td>Enabling Factors 1) Computer availability and accessibility; 2) Teacher knowledge of and skill with computer technology; 3) Teacher access to peer networks; 4) Support for continuing education; 5) Specific CT training; 6) Teacher motivation / determination; 7) Information technology support.</td>
<td>Attitude Barriers 1) Apathy toward change; 2) Discomfort with computer technology; 3) Lack of self-motivation; 4) School and teacher capacity implement technology-based curricula.</td>
</tr>
<tr>
<td>Relative Advantages include: 1) provides up-to-date information; 2) online method of delivery; 3) allows for differentiation of student learning styles; 4) convenient for teachers to use.</td>
<td>Reinforcing Factors 1) Positive student responses to CT; 2) CT is convenient for teachers to use; 3) CT is a respite from usual student behavior; 4) Technical features of CT engage students in lessons; 5) Effective classroom management structures.</td>
<td>Critical Mass (factors related to failure to achieve a critical mass) 1) Attrition; 2) Lack of sustained training for CT; 3) Insufficient onsite IT support; 4) Lack of sustained outreach by CT project staff.</td>
</tr>
<tr>
<td>CT is Compatible with: 1) school athletic values; 2) student and teacher preferences for tactile learning experiences; 3) teacher interests in role modeling non-smoking behavior; 4) teacher support for continuing education.</td>
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</tr>
</tbody>
</table>

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Diffusion of Innovations Factors | PRECEDE Model Factors | Non-DOI or PRECEDE Emergent Factors
--- | --- | ---
**Complexity** of CT is defined in terms:  
1) technical domain - Internet accessibility, firewalls, bandwidth, downloading; Reliability of Internet access was a problem; teachers with limited knowledge of and comfort with computers were unsuccessful;  
2) curriculum domain - easy for teachers and students to use.

**Trialability** of CT:  
1) available on the World

**Observability** of CT:  
1) obstructed due to relative isolation of computer labs and classrooms;  
2) individualized nature of CT curriculum obstructs ability to observe outcomes.

**Social System** factors:  
1) innovative district administrators can influence adoption;  
2) Opinion leaders who are early adopters can influence adoption.
Hypothesis Test

Hypothesis: "Teachers who adopt CT are more likely to A) self-identify as early adopters, B) possess personal characteristics, C) participate in social systems, and D) observe environmental and innovation-specific characteristics associated with the DOI and PRECEDE model."

Evidence from the survey portion of this study suggested that self-classified early adopters were not more likely to have adopted CT (Part A of the hypothesis). While they more likely to have agreed to be interviewed for the interview portion of this study, they did not adopt more frequently than later adopters. This conclusion must be qualified since self-classification of adoption practices is subject to pro-innovation bias. Participants may not have accurately classified themselves. Misclassification results in skewing of adoption classification data to the right and therefore does not provide enough discrimination in the data to detect group differences.

The interview portion of the study verified that self-classification of behavioral adoption practices may not be a valid and reliable method for classifying teachers. For example, one teacher who classified herself as an early adopter of computer technology could not even successfully download the plug-ins required to run the CT website. Teachers who self-reported as early adopters were not more likely to adopt the CT curriculum.

The following personal and communications systems characteristics were tested to determine their association with frequency of CT use: how they heard about CT; incentive factors that influenced registration for a training seminar; personal and school district adoption characteristics (e.g., early adopter, late majority, etc); comfort level with computer technology; formal training in use of computers or Internet;
the year that the participant received his or her undergraduate degree; the presence of and advanced degree; gender; and age. None of these variables was statistically associated with adoption of CT (Parts B of the hypothesis). This lack of a positive finding from the survey data to support the hypothesis may have been due to the small sample size in this study, and to the pro-innovation bias that positively skewed the adoption classification data.

The weight of evidence from the interview data however, suggest that the most influential personal adoption characteristics were: teacher interest in alternative instructional methods that allow for differentiation of student learning styles; CT is convenient to access and free to use; positive student response to using computers in school; availability of school IT support and personal relations between teachers and IT staff, and; organizational (school district and school administration) support for use of computers in the classroom and the resultant application of school district resources.

There was limited but convincing evidence suggesting that social/communications systems can promote dissemination but may only be effective within a school district (Part C of the hypothesis). Teacher information and social networks helped create knowledge about CT that resulted in its dissemination. However, these social systems did not promote adoption decisions, implementation or confirmation of use across school districts. One interview participant reported that he had rejected the CT curriculum after having problems accessing it and then later adopted it after learning from another teacher in a faculty meeting within the same school district, how to manage the technical problems he had encountered. No similar communication account was recorded in this investigation that disclosed post-training
communications across school districts. This data suggest that participation in social systems influences adoption practices only within a sphere of communication where there is regular interaction.

The interview data disclosed that those teachers who adopted, implemented and were maintaining use of CT were more likely to describe: the relative advantages of CT; how it was compatible with their professional interests and pedagogic approaches to teaching; how it was easily tried, and; how the complexity of the program and the technology cluster were easy to manage. The teachers who had successfully implemented CT also found ways to re-invent the innovation to fit their teaching style and the computing environment with in which they worked. While they acknowledged the barriers to implementation, they described effective use of school district IT resources and good communications with IT support staff. These teachers more frequently described environmental factors that predisposed (e.g., school district administrative support and resource allocation), enabled (e.g., local IT support, adequate access to computers) and reinforced (e.g., student feedback, successful classroom management) adoption and implementation of CT. Teachers who adopted, implemented and were maintaining CT were more likely to have observed the positive or assets-based constructs from the DOI and PRECEDE models (Part D of the hypothesis). While they observed barrier factors, they were more likely to describe them as challenges that they had to overcome.
CHAPTER 7
CONCLUSIONS

This research found that individual and environmental factors can influence dissemination and adoption of a web-based tobacco education curriculum. While it collected data from individual teachers and administrators, it disclosed that many of the factors that influenced dissemination and adoption of the CT curriculum were in the environmental domain. For example, while teacher knowledge and skill with computer technology and teacher motivation / determination to use the CT program were important individual factors that influenced adoption, school environmental factors such as too few computers or poor access to computers were factors that potentially superceded those individual characteristics. It is therefore important for change agents and educators to consider both individual and environmental factors when planning and implementing technology-based curricula in schools.

The DOI and PRECEDE models provide excellent frameworks for planning and evaluating dissemination and adoption strategies. However, strict reliance on the constructs in these theoretical models when planning dissemination (e.g., promotion of relative advantages, getting input from self-identified early adopters) may blind change agents to the barriers that can significantly impede adoption and implementation.

Individual teacher characteristics (e.g., teacher interest in alternative instructional methods, teacher perception of positive student response to using computers in school) can provide the motivation for adoption of technology-based
classroom curricula, but the school environment and school policies (e.g., reliability of the school's technology cluster, systems that regulate or schedule computer use) enable this motivation to be realized. Since time is a precious commodity for teachers and struggles with technology can take more professional or personal time than some teachers are willing to devote (e.g., downloading plug-ins on 30 computers in a computer lab could take many hours), many teachers will abandon their efforts to use technology if problems are encountered in the environmental realm. It appears that many teachers are easily discouraged from using computers for instructional purposes if hardware access or utilization problems are encountered. Previous unsatisfactory experiences with using computers in the classroom may even discourage many teachers from trying new computer innovations.

**Recommendations for Policy Change**

School administrators should assure that teachers have easy access to computers for instructional purposes and that technical support for use of computers is available to assure that they will succeed with their efforts. Assessments of the effectiveness of present gate-keeping systems that regulate computer laboratory access would be a first step toward improved computer access. Do current computer lab scheduling systems facilitate or impede use of computers for instructional purposes? What scheduling systems optimize student access to computers? What characteristics of these systems and computer labs tend to promote student access? What other school-specific barriers to use of computers for instructional purposes exist and how could they be eliminated?
Since IT support staff in schools support the instructional efforts of teachers, school administrators could require that these personnel regularly conduct customer satisfaction surveys to assess teacher and student satisfaction with the computing environment and to identify methods for improving that environment. Operational plans to support classroom use of computers could lead to more user friendly computing environments and better trained teachers.

Teachers can be effective users of computers if the computing environment is easy to access, reliable and supported by IT staff. Otherwise, only those teachers who are technically savvy will succeed. School administrators are therefore, challenged to identify the resources (hardware, software, IT support, broadband connection) needed to create and support a productive instructional computing environment. Computer laboratories by their nature are not always readily available for teacher and student use. They are most often “down the hall,” away from the immediate instructional / learning environment. Closing this gap is perhaps one of the most significant steps that can be taken towards improved use of computers in the classroom.

One promising model for closing the gap between the classroom and the computer lab was discovered during this investigation - the mobile computing lab. The mobile lab described by one of the study participants was a cart that contained 15 laptop computers with wireless Internet connections. The cart was rolled into the classroom when and where it was needed. IT staff, with teacher input and assistance, assured that the software was operational and fully functioning before it was moved to the classroom. This model deserves serious consideration as a means to improve use of computers in schools.

Teacher training on classroom management and pedagogical techniques when utilizing online curriculum could help promote effective use of computer
technology and online curricula. The training that was provided by CT Project staff is an example of this type of training but it must be sustained if it is to effectively influence teacher attitudes and practices regarding classroom use of computers. Training efforts should directly address teacher attitudes and beliefs regarding classroom use of computers and their traditional instructional styles if they are to be effective (Hannafin, Savenye; 1993).

Testing of teacher technical and pedagogic capacity to deliver online programs is an important first step for school districts that are committed to use of online curriculum. Teachers who are deficient in these skill areas could be encouraged to complete continuing education classes to provide them with the skills and confidence to effectively use computers and online curricula.

Hiring qualifications for teachers could require some level of certification in computer use. Teacher preparation institutions could add or redirect their instructional efforts to include use of online curricula as a component of teacher preparation curricula. Teacher preparation and/or certification policy changes could be implemented at the state and local school district levels.

**Future Research**

Future research into effective dissemination strategies for web-based curricula should preliminarily use qualitative methods (focus groups, interviews, observations) to identify specific barriers to dissemination. Before designing and testing online classroom curricula, educators, web-designers and program evaluators should investigate environmental predisposing, enabling, reinforcing and barrier factors that could influence the fidelity of the curriculum and ultimately influence expected
outcomes. Awareness of these factors will provide change agents with information to help maximize the effectiveness of future online curriculum dissemination efforts. Focus groups and other qualitative methods could help identify school- and school district-specific barriers to dissemination of online curriculum in the classroom.

While use of theoretical models like PRECEDE and DOI can guide sound theoretical dissemination strategies, they may lead change agents to be complacent and to focus solely on the assets side of the dissemination equation, thus failing to address the liability side of the equation. Active intervention efforts to address barriers to dissemination disclosed in this research (e.g., lack of sustained technical support after training, limited teacher capacity to implement technology-based curricula) could be tested against more passive approaches, such as the approach that was used in the 2001-02 dissemination of CT in Colorado schools. Systematic, active, post-training session outreach strategies by change agents providing technical assistance (e.g., telephone calls to teachers on a bi-monthly basis) would likely increase adoption of online school curriculum.

Conducting pre-dissemination assessments of teachers and administrators to determine whether or not they are contemplating a curriculum change, prior to future dissemination efforts, may help change agents focus their efforts on the most “changeable” teachers, thus making these efforts more efficient and effective. Similarly, an assessment of school technical capacity (human and technical resources) prior to dissemination may help focus curriculum dissemination efforts on schools that have the greatest potential for adoption. Developing and testing of such assessment instruments is an area for future research.
Testing the effectiveness of mobile computer laboratories with outcomes such as teacher and student satisfaction, technical functioning, ease of access, maintenance costs, operational problems (scheduling, mobility) and security is a potentially important area for investigation.

Creating social/communication networks of potential curriculum adopters may have potential to promote adoption of online curriculum. While this is a more passive approach that change agents could use, it may be a very practical one since funds are often not available to change agents for active outreach to or follow-up with teachers who are trained to use specific online curricula. Since many health education teachers are isolated from their peers, particularly in small rural schools, creating a support network, where curriculum adoption successes and problems could be shared, holds potential to promote more widespread adoption of online curricula. Establishing an email listserv or a buddy system approach where a technology-competent teacher is partnered with a teacher who is less competent could be an effective means of promoting curriculum adoption.
This questionnaire is intended to gather information from Colorado educators who attended a training session for the Consider This online tobacco education curriculum in the Fall of 2001. The purpose of this study is to evaluate how well this curriculum has been disseminated to Colorado schools. Your input is essential to the success of this study, so please take a few minutes and answer the following questions. Return the questionnaire in the enclosed post-paid envelope. Your responses will be kept confidential.

1. My records indicate that you attended a training seminar on the Consider This (CT) Online Tobacco Education Program, sponsored by AMC Cancer Research Center in the Fall of 2001. Is this correct?
   (Check one.)
   [ ] Yes (If YES, continue with this questionnaire.)
   [ ] No (If NO, please do not complete this questionnaire, but return it in envelope provided.)

2. Check the category that best describes your position in your school district in the Spring of 2002.
   (Check one.)
   [ ] Teacher
   [ ] Administrator
   [ ] Principal
   [ ] Information technology staff
   [ ] Other (Describe) ____________________________

3. How did you initially hear about CT? (Check all that apply.)
   [ ] Brochure or poster received in the mail
   [ ] Principal told me
   [ ] Another teacher in my school told me
   [ ] A district administrator told me
   [ ] A computer technology staff person told
   [ ] Don’t remember
   [ ] Other (Describe) ____________________________
4. What factors influenced your registration and attendance at this training seminar?

(Check all that apply.)

- The training seminar was free
- Our school needed a new or supplemental tobacco education curriculum
- Substitute teacher expenses were reimbursed
- Travel expense (mileage) was reimbursed
- The training session was relatively close to my home or school
- Online instructional aspect of curriculum was appealing
- I was required to go by a supervisor or administrator
- AMC provided lunch at the seminar
- CT is compatible with national education standards
- CT is a student-directed, tailored, interactive curriculum
- CT is free for schools to use
- Continuing education credits were offered
- Other ____________________

5. The training seminar for the CT program was ..... (Check one.)

- Very helpful
- Helpful
- Unhelpful
- Very unhelpful

TEACHERS ONLY -- QUESTIONS 6-10 -- ALL OTHERS SKIP TO QUESTION #11.

6. How frequently did you use CT in your classes?

(Check one.)

- Never (GO TO NEXT QUESTION.)
- I tried it for one class period only and did not use it again
- I tried it for a few class periods and did not use it again
- I used it for multiple class periods for one class group
- I used it for multiple class periods for two class groups
- I used it for 3 or more class groups

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7. If you never used CT, why not?
   (Check all that apply.)
   - I could not fit it into my class schedule
   - My school did not have the appropriate Internet connection
   - The technology was too cumbersome to use
   - I was uncomfortable using technology in the classroom
   - It was too difficult to arrange computer lab time for my classes
   - I did not have time to learn how to use it
   - The support materials were not useful
   - Other

   SKIP TO Q. 11

8. Did you use CT during the 2001-2002 school year?
   (Check one.)
   - Yes
   - No
   - I don’t remember

9. Did you use CT during the 2002-2003 school year?
   (Check one.)
   - Yes
   - No
   - I don’t remember

10. If you used Consider This, overall how satisfied were you with the CT program?
    (CIRCLE one number on the scale if you used CT.)
    (CHECK HERE if you never used CT.)

    1 2 3 4 5 6 7 8 9 10

    Not at all Satisfied Completely Satisfied
11. When a new or innovative idea / technology comes along, when does your school district adopt it? (Check one.)

- We are usually among the first to try it
- We usually try it after a few others have tried it
- We usually try it after most others have tried it
- We usually try it long after most other people have tried it

12. When a new or innovative idea / technology comes along, when do you adopt it?
   (Check one.)

- We are usually among the first to try it
- We usually try it after a few others have tried it
- We usually try it after most others have tried it
- We usually try it long after most other people have tried it

13. How would you describe your comfort level with computer technology?
   (Check one.)

- Very Comfortable
- Somewhat Comfortable
- Somewhat Uncomfortable
- Very Uncomfortable

14. Have you had any formal training in the use of computers and/or use of the internet?
   (Check one.)

- Yes (If Yes, Describe the training ______________________)
- No

15. When did you get your undergraduate college degree?

   Year _____

16. Do you have an advanced degree?

- Yes (If YES, Degree ______________________)
- No
17. Gender  M  F

18. Age:  _____ Years

19. During the past 30 days, on how many days did you smoke cigarettes?  (Check one.)

☐ 0 days  
☐ 1 or 2 days  
☐ 3 to 5 days  
☐ 6 to 9 days  
☐ 10 to 19 days  
☐ 20 to 29 days  
☐ All 30 days

20. What is your ethnicity (or race)?  (Check one.)

☐ White  
☐ Black  
☐ Asian/Pacific Islander  
☐ American Indian/Alaska Native  
☐ Other [specify]

21. Are you Hispanic or Latino?  (Check one.)

☐ Yes  
☐ No  
☐ Don't Know

22. Are you willing to help further with this research by being interviewed on the telephone for 15 to 20 minutes?  (Check one.)

☐ Yes (Please check YES, to help me proceed toward my doctoral degree.)
☐ No  
☐ Don't Know

If you are willing to be interviewed, please enter your name, phone number and e-mail address where you can be contacted during the summer months. Your name and contact information will be held in strictest confidence. (The human
subjects aspects of this research have been approved by the Human Subject Research Committee at the University of Colorado, Denver.) Should you agree to be interviewed, I will contact you to arrange a convenient time. I promise to take no more than 20 minutes of your Summer. You need not have used Consider This to be eligible for the interviews. For this study to be successful, I need to interview users and non-users, administrators, principals and information technology staff who attended one of the training seminars. I hope you will help me with this study. It will help determine the factors that influence dissemination of online instructional curriculum in schools.

Your Name: ________________________________

School Phone: (___)___ - ____ Home Phone Number: (___)____ - _____

Summer e-mail address: ________________________________

Please return this questionnaire in the enclosed postage paid envelope to: Walter Young, [Home address]
APPENDIX B

Consider This Interview Guide

Participant name: ___________________________ Date: __________________
School: ________________________________________________

Thank you for agreeing to help with this research. Once again, the information you provide in this interview will help me describe the dissemination process for Consider This and identify the factors that impede, reinforce and enable adoption and implementation of the Consider This (CT) online curriculum.

1. Tell me about the tobacco use among DCSD middle school students.

2. How has the School District responded?

3. Have you heard of the online Consider This tobacco use prevention curriculum?
   ____ YES  ____ NO
   If YES, have you used the CT curriculum in the classroom?
   ____ YES  ____ NO  ____ N/A (administrator)  ____ NO (New Teacher 2002-03)

   If YES - Tell me how you first heard of CT. (explore local vs. non-local communication channels and social system networks: e.g., who?, when?, how? and why?)

PROBES-

What promotional materials did you see regarding the CT curriculum?
What happened in your school or school district to encourage use of CT?
What do you do to teach your students about tobacco use?
How often did you or others that you work with use the CT curriculum last year?
Have you used the CT curriculum this year?
Did you attend a training?
If NO - If subject has never heard of the CT curriculum, ask them:

What do you do to educate your students about tobacco use?
Why did you choose that curriculum or approach?
Why did you not use the CT curriculum?

5. How did you initially hear about CT?

6. How well did the training seminar prepare you to use the CT program?
   - Very well
   - Somewhat well
   - Not well at all

7. Would you have used CT without having attended the training?
   - Yes
   - No

   - No (If NO, why not?)

8. Who among DCSD employees do you consult with most frequently on health education matters?
   Name ___________________________ School ________________________________
   ________________________________ ________________________________
   ________________________________ ________________________________

9. What outside sources of health education information do you consult with most frequently?
   Name __________ Organization ________________________________
   ________________________________ ________________________________
   ________________________________ ________________________________

GO TO #14, IF AN ADMINISTRATOR
TEACHER QUESTIONS

10. Have you had any experiences implementing Consider This (or other Web-based curriculum) that were especially positive or negative?

A. Please tell me about the last such incident. What happened?

PROBES –

When did this occur?
What was especially positive or negative about that experience?
What led up to the incident?
Who was involved? How did their involvement influence the outcome?
What was the outcome of the incident?
What do you believe to be the most important factors that influenced the outcome?

B. Any other positive or negative incidents implementing CT? What happened?

Same PROBES as above.

11. If asked by teachers or administrators in other school districts to describe the CT curriculum, how would you describe it?

PROBES –

How would you describe the CT content?
How would you describe the CT technology?
How would you describe student response?
How would you describe DCSD technical support for CT?

12. Describe the advantages to using the CT tobacco use prevention curriculum.

________________________________________________________________________

________________________________________________________________________

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13. Describe the advantages to using non-technology-based tobacco use prevention curricula.

____________________________________________________________________________

14. How often did you use the Internet in your health classes before using the CT program?
   ___ Never
   ___ Once or twice before
   ___ 3 or more times

15. How often have you used an Internet-based health curriculum in your health classes before using the CT program?
   ___ Never
   ___ Once or twice before
   ___ 3 or more times

16. Overall, on a scale of 1-10 (with 10 being completely satisfied), how satisfied were you with the CT program?
   ___ Record number

17. Will you be using CT in any of your classrooms during the remainder of this school year?
   ___ YES   ___ NO

   If YES, can I observe one of these classes and ask your class about their experience using CT? WHEN?

____________________________________________________________________________

GO TO # 24
ADMINISTRATOR QUESTIONS

18. From an administrator's perspective, how would you describe CT to others?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

19. From an administrator's perspective, list the advantages to using A technology-based tobacco use prevention curricula like the CT tobacco use prevention curriculum.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

20. List the advantages to using non-technology-based tobacco use prevention curricula.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

21. Describe how CT fits with instructional values of DCSD teachers.

________________________________________________________________________
________________________________________________________________________

22. Describe how CT fits with values of IT personnel?

________________________________________________________________________
________________________________________________________________________

23. When a new or innovative idea / technology comes along, when does DCSD adopt it?

READ CHOICES

___ We are usually among the first to try it (early adopters)
___ We usually try it after a few others have tried it (early majority)
___ We usually try it after most others have tried it (late majority)
___ We usually try it long after most other people have tried it (laggards)

GO TO # 24
POLICY QUESTIONS (ALL PARTICIPANTS)

24. What tobacco use prevention curriculum did DCSD use prior to CT?

25. Why did DCSD decide to adopt CT last year?

26. What tobacco use prevention curriculum is DCSD using this year?

27. Describe DCSD policies regarding teacher / staff continuing education.

28. Describe the policy regarding continuing education during work hours. Incentives?

29. Describe the attitude of administrators regarding continuing education during work hours.

30. Describe the attitude about computer-based instruction among administrators.
31. Describe the attitude about computer-based instruction among teachers.

32. How many times during the past year have you taken continuing education classes during school hours?

____ Never
____ Once
____ Twice
____ 3 or more times

SUBJECT CHARACTERISTICS (ALL PARTICIPANTS)

33. When a new or innovative idea/technology comes along, when do you adopt it?

READ CHOICES

____ I am usually among the first to try it (early adopters)
____ I usually try it after a few others have tried it (early majority)
____ I usually try it after most others have tried it (late majority)
____ I usually try it long after most other people have tried it (laggards)

34. How would you describe your comfort level with computer technology?

READ CHOICES

____ Very Comfortable
____ Somewhat Comfortable
____ Somewhat Uncomfortable
____ Very Uncomfortable

35. When did you get your undergraduate college degree?

Year _____

36. Do you have an advanced degree?

Yes ____ No ____ (If YES, Degree __________________)
37. Have you had any training in the use of computers and/or use of the Internet?

   Yes ___  No ___  (If YES, Describe training) __________________________

38. How often did you use the Internet as an in-class instructional tool before using CT?

   ___ Never
   ___ Once or twice before
   ___ 3 or more times

39. How often do you use email?

   ___ Never
   ___ A few times per month
   ___ Once or twice per week
   ___ Daily

40. Describe your previous use of health education curriculum (substance abuse, tobacco use)

   ______________________________________________________________
   ______________________________________________________________

41. Smoking History

   ___ Never smoker
   ___ Former smoker
      How long ago did you quit? ___ Years ___ Months
   ___ Current smoker
      How many cigarettes per day? _________ Cigarettes
      How many years? _________ Years

42. Is there anything else about dissemination or use of the CT curriculum in your school that you would like to tell me?

43. Gender M ___  F ___

44. Age: _________ Years


   Thanks for helping me with this research!
APPENDIX C

Employee Consent

**Employee consent to participate in the study entitled -**
"Understanding factors that influence the dissemination of Web-based health education curricula"

1) **Who is conducting the study?**
This study involves research being done by Mr. Walter 'Snip' Young (principal investigator), with permission from the Douglas County School District (DCSD). He is a doctoral student at the University of Colorado, Denver and works at The Cooper Institute, Golden, Colorado. The Institutional Review Boards at the University of Colorado, Denver (UCD) and The Cooper Institute (CI) have approved this research project.

2) **Why is this study being done?**
The goal of this study is to discover the factors that influence the use of the Web-based tobacco use prevention health education curriculum, Consider This (CT), a product of CI. Identifying and understanding these factors will help educators and researchers advance the use of information technology in classrooms.

3) **How will this study involve me?**
We are asking you and other DCSD employees to take part in the research project entitled "Understanding factors that influence the dissemination of Web-based health education curricula." Your consent to participate allows the principal investigator to record and analyze your impressions or observations of the factors that influence use of the CT curriculum.

Mr. Young will be interviewing approximately 30 DCSD personnel to record impressions or observations related to the research topic. He will be asking questions related to the curriculum itself, the school environment, teacher preparedness, and the information technology environment. In a separate part of this study, he will be observing classrooms where CT is being used and asking questions of three or four students.

4) **How long will my participation in the study last?**
This study requires an interview with Mr. Young for approximately 30-60 minutes. You may be called by Mr. Young, after the interview, to clarify or expand on a response(s) to his questions.
5) **What are the benefits, if any, of joining this study?**
Researchers at the PEW Trust reported that, "there is a substantial disconnect between how students use the Internet for school homework and how they use it during the school day and under teacher direction." This study will provide an improved understanding of how teachers and students can use the Internet in school. There will be no direct benefit to you.

6) **What are the risks in joining the study?**
You will be asked to reveal your impressions and observations related to the barrier and enabling factors to use of the Internet in the Douglas County School District. While confidentiality of the information that you reveal Mr. Young is protected by federal statute and he is required to take all necessary precautions to protect that information, there is a very small risk that the information you reveal could be disclosed. In the unlikely event that this information should be disclosed to your employer and the nature of your replies is objectionable, your standing in the DCSD could be jeopardized. This is however, highly unlikely since Mr. Young will at no time report or disclose interview responses with identifying information on study subjects. Field notes will be coded and subject identifiers removed. The decoding log will be kept in a separate location from the field notes. Audiotapes will be kept in a separate location from the field notes. Audiotapes will be coded during analysis and destroyed once the study is complete. While not designed to elicit embarrassment, you may find that some questions may embarrass you.

7) **Are there other ways to answer the research questions?**
No method of data collection was thought to be as effective as interviews with school district personnel. Survey questionnaires were considered as an alternative data collection procedure, but it was determined that interview data and related inter-personal interactions would be a much richer source of information.

8) **What will happen to the information the study keeps?**
All the information you and other DCSD employees provide will be kept private and confidential. No names or individual responses will be reported. Completed interview transcripts and audio tapes and computer files will be kept in a locked file at Mr. Young's home, with access limited only to Mr. Young.

9) **What will happen if I say "No" to this study?**
Participation in this study is strictly voluntary. If you decide not to participate, no one other than Mr. Young will know. Your refusal will not be revealed to anyone.
10) **Who do I speak with if I have questions about the study?**

If you have any questions before, during or after the study your rights as a research subject, you may call the office of academic Affairs, CU-Denver Building, Suite 700, (303) 556-2550. In addition, if you have questions about taking part in this study, you may call Walter Young, the Principal Investigator, at (303) 237-5519.

**Agreement**

This consent form and my part in the research study are clear to me. If I have any questions or problems with the study, I can contact the Principal Investigator. I agree to participate in this research study and have been given a copy of this consent form for my records.

Study Subject: __________________________________________

Date: _________________________
**APPENDIX D**

Internet Use from Any Location by Individuals Age Three and Older

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<thead>
<tr>
<th></th>
<th>Internet use (percent of total U.S. population)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>22.2%</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>24.3%</td>
</tr>
<tr>
<td>Female</td>
<td>20.2%</td>
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<tr>
<td><strong>Race/origin</strong></td>
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<tr>
<td>White</td>
<td>25.3%</td>
</tr>
<tr>
<td>Black</td>
<td>13.2%</td>
</tr>
<tr>
<td>Asian American &amp; Pacific Islander</td>
<td>26.4%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>11.0%</td>
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<tr>
<td><strong>Employment status</strong></td>
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<tr>
<td>Employed</td>
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<tr>
<td>Not employed</td>
<td>12.4%</td>
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<tr>
<td><strong>Family income</strong></td>
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<td>Less than $15,000</td>
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<td>Beyond bachelor’s degree</td>
<td>51.9%</td>
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<td><strong>Age group</strong></td>
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## Internet Use from Any Location by Individuals Age Three and Older

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### Geographic location of household in which the individual lives

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<th>Female</th>
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<th>Female</th>
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<td>49.1</td>
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### Household type in which the individual lives

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<thead>
<tr>
<th>Household Type</th>
<th>Male</th>
<th>Female</th>
<th>Male</th>
<th>Female</th>
<th>Male</th>
<th>Female</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married couple w/children &lt;18 years old</td>
<td>26.7</td>
<td>37.6</td>
<td>50.6</td>
<td>62.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male household w/children &lt;18 years old</td>
<td>18.2</td>
<td>25.4</td>
<td>34.5</td>
<td>45.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female household w/children &lt;18 years old</td>
<td>14.8</td>
<td>22.3</td>
<td>32.9</td>
<td>45.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family household without children 18 years old</td>
<td>19.6</td>
<td>30.0</td>
<td>41.4</td>
<td>50.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-family household</td>
<td>21.1</td>
<td>32.9</td>
<td>42.7</td>
<td>47.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Age 16 and older.
3. Both people who are unemployed and people not in the labor force.
4. Age 25 and older.

ENDNOTES

1 The Safe and Drug-free Schools Program is a program of the Colorado Department of Education that funds staff positions that work to reduce the use tobacco, alcohol and other drugs in selected schools throughout Colorado.

2 From Wilson, Sherry, Dobrovolny, Batty & Ryder, adapted from Ely, 1999.


5 The Cooper Institute is “a non-profit research organization dedicated to advancing the understanding of the relationship between living habits and health…” (2003 annual report).

6 From Rogers, 1995, p. 163.

7 From http://www.ldpride.net/learningstyles,MI.htm#What%20are, March 16, 2004

REFERENCES


