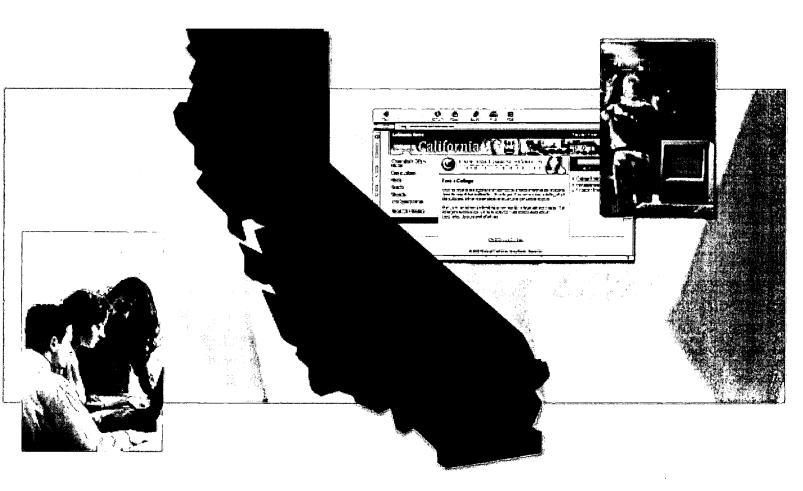ABSTRACT

        The @ONE project at De Anza College, California, funded by
the California Community College Chancellor's Office, was intended to assist
faculty in enhancing instruction through the effective use of technology. In
spite of the millions of dollars spent by the California Community Colleges
to implement information technology in the campus environment, little is
known about the impact of instructional technology on student learning, or
about how best to train faculty to use technology. In 2001-02, the @ONE
project commissioned a research project that would inform future faculty
development efforts throughout the state. The Center for Student Success
(CSS) examined the literature, made an ethnographic study, and conducted a
survey. For literature review, CSS screened over 100 potential titles focused
on effective practice in faculty development. Thirty citations from 1995 or
later were reviewed, abstracted, and synthesized. The ethnographic study
included site visits, interviews, and observations conducted at two colleges
chosen for use of technology in instruction and active @ONE participation.
Ninety-three respondents completed the survey, which focused on evaluating
@ONE services, the application to instruction, and the perceived benefits to
teaching and learning. The findings indicate that the relationship between
faculty development efforts and resulting technology integration in the
classroom is a complex one depending on external factors. (AUTH/NB)

Integrating Instructional Technology
in the California Community Colleges

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Acknowledgements

The research described in this document, as well as the faculty development
provided by the @ONE Project at De Anza College from 1997-2002, would not
have been possible without the support and contributions of several gifted
leaders and their organizations. We would like to recognize their contributions.

Center for Student Success (CSS)

The Center for Student Success was contracted by @ONE at De Anza College
to conduct a groundbreaking research effort to examine the impact of faculty
development services on technology integration in instruction. The results of
that research form the basis for this document. The quality of the CSS research
is a tribute to the quality of the researchers that CSS employed:

Dr. Brad, Phillips, Project Director
Dr. Kenneth Meehan, Lead Researcher for the Survey Study
Dr. Susan Obler, Lead Researcher for the Ethnographic Study
Ms. Eva B. Schiorring, Lead Researcher for the Ethnographic Study
Dr. Andreea M. Serban, Lead Researcher for the Literature Review

California Community College Chancellor's Office

The Chancellor's Office had the foresight to develop and fund the @ONE
project in 1997. The program was intended to assist faculty to enhance instruc-
tion through the effective use of technology. The persons most responsible for
that vision and its implementation over the last five years are LeBaron
Woodyard and Catherine McKenzie.

De Anza College

De Anza College was awarded the first @ONE grant and has defined and
operated the program for the past five years. The groundbreaking work done
by @ONE and other statewide projects such as the California Virtual Campus
has steadily improved instructional technology in the community colleges. The
focus of the project was the development of resources that could be used by
campuses to address their faculty development needs. Two people in particu-
lar are responsible for making this project so successful:

Dr. Martha Kanter, President of De Anza, whose vision and support made it
possible to establish @ONE at De Anza and make it a vibrant part of the
California Community Colleges.

Ann Koda, @ONE Project Director for the first four years of the grant, who
turned the vision into a reality and made the project an asset to all the Califor-
nia Community Colleges and their faculty.

Why research Faculty Development and Technology Integration?

Over the last decade California Community Colleges have spent millions of dollars implementing information technology in the campus environment. Much of this money has focused on improving the computing infrastructure of the campus to better support all aspects of the campus operation. However, a large portion of the expenditure has supported the introduction and use of new technology in the classroom. In part, this has been done because the students that are being served by the colleges demand such technology and their future employers demand technology literate employees. In part it has been done to help address the current increase in enrollment without having to build new campuses and expand physical plant. But on balance, it has also been done to improve instruction and enhance student learning.

However, very little is known about the impact of instructional technology on student learning, and little is known about how to best train faculty to use technology to enhance student outcomes in higher education. In fact, there are no federally funded research Centers that have investigated faculty development in Higher Education and technology use. Further adding to the lack of information of what works best in this arena, is the fact that faculty development is the purview of each individual campus which funds it, defines it, and operates it.

In 2001-2002, the @ONE project at De Anza College seized the opportunity to commission a landmark research project that would inform future faculty development efforts throughout the state. The Center for Student Success research provided evaluative data about @ONE services, but in addition provided significant insights into the following critical questions:
- What faculty development methods best foster effective technology integration in instruction?
- What organizational conditions and enabling factors contribute to campus-wide integration of instructional technology?
- What benefits do the faculty derive from faculty development efforts?
- What benefits do the students derive from the use of technology by trained faculty?

The @ONE project at De Anza College conducted two statewide needs assessments -- the first in 1998 to establish baseline needs and capabilities in the area of faculty development and technology use in the classroom. The initial study confirmed that there must be receptive faculty attitudes, appropriate skills and knowledge, and sufficient institutional support systems in order to achieve the benefits of technology in the classroom. The second study in 2000 found that there had been significant improvements in faculty and student access to technology in the two-year period and to technical support, but that there was still much improvement that needed to take place. Much of this improvement had to do with funding and institutional support.

The Investigation: Faculty Development and Its Impact

The Center for Student Success (CSS) conducted a three-prong research study that resulted in important information on faculty development, its impact on technology integration and what factors mediated this relationship. The CSS investigation included:

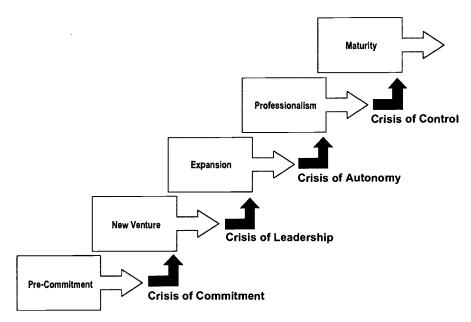| LITERATURE REVIEW	ETHNOGRAPHIC STUDY	SURVEY
Screened over 100 potential titles focused on effective practice in faculty development Thirty citations from 1995 or later reviewed, abstracted and synthesized	Site visits, interviews and observations conducted at two colleges chosen for use of technology in instruction and active @ONE participation.	Survey focused on evaluating @ONE services, the application to instruction and percieved benefits to teaching and learning. 93 respondents completed survey

The results of this research provide valuable information on how to build, grow and support Faculty Developments efforts aimed at assisting faculty in integrating technology into their classrooms.

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A Growth Model for Instructional Technology Integration

The research conducted by CSS and the two needs assessments conducted by @ONE all demonstrated that the relationship between faculty development efforts and resulting technology integration in the classroom is a complex one. Specifically, the relationship depended upon external factors such as the organizational support environment and its characteristics, certain enabling factors, and varied over time.

This growth can be viewed as a natural progression from one stage of development to another, similar to any programmatic maturity model. Further, the transition from one stage to another is characterized by a specific challenge that must be met in order to advance. The growth model for comprehensive technology Integration can be depicted as the model below*:

Maturity

Professionalism → **Crisis of Control**

Expansion → **Crisis of Autonomy**

New Venture → **Crisis of Leadership**

Pre-Commitment → **Crisis of Commitment**

The key aspect of this model is the resolution of a unique challenge in order to advance to the next stage.

The CSS Literature Review suggests a set of basic "enabling factors" without which the likelihood of successful deployment and implementation of instructional technology is reduced. These factors include:
- Universal student access to computers
- Reliable networks,
- Multiple opportunities for training and consulting, and
- A faculty ethos that values experimentation and tolerates failures.

The Ethnographic Study confirmed the importance of these "enablers".

*Adapted from Mc Clure, P.F. *New Entrepreneur Guidebook*, Menlo Part, CA: Crisp Management Library, 1998

Addressing the Challenges in Supporting Instructional Technology Over Stages of Growth

To resolve each challenge, a campus must mobilize resources in three different areas:

- Organizational support,
- Professional development activities, and
- Technology utilization and instructional application.

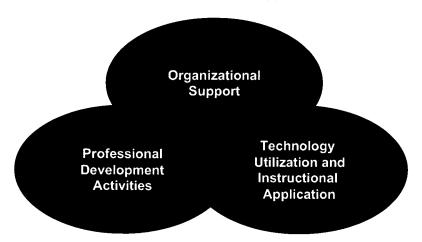Further, the campus must configure the resources in a manner that best addresses the challenge. There must be recognition of key drivers in the three areas. The CSS research identified key drivers in each area.

Organizational Support Conditions:

Leadership – the extent of involvement of key campus leaders
Funding – the consistency of funding for technology and faculty development
Infrastructure – the nature of the technical infrastructure and its ability to support instructional technology integration

Professional Development Activities:

Focus – the substance and content of the faculty development activities
Delivery – the method of delivery used for faculty development activities
Format – the faculty development activities are located and their frequency

Instructional Technology Utilization

Participants – the nature of faculty groups involved
Uses – the primary use of technology in the classroom/instruction
Assessment – how frequently and with what focus is assessment conducted

The table on the following pages examines the characteristics of each stage of the growth model in terms of the above categories so that as a Campus Leader you can assess your faculty development efforts, your institutional support and the resulting technology integration.

The CSS ethnographic study confirmed the importance of the "enabling factors." The study found that three primary factors had a pronounced impact on either supporting or compromising training initiatives in the two colleges studied: leadership, infrastructure, and funding.

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The CSS review of the literature shows that the literature places significant emphasis on:

- The differentiation of faculty into early adopters and second wave instructional technology users,
- Faculty concerns in adopting instructional technology and
- The types of organizational conditions that are conducive to successful faculty development in instructional technology.

Stages of Development:

Organizational Support Conditions

Stage 4: Maturity

Leadership: Leaders committed and supportive in all key areas and at the top of the organization

Funding: Annual budget line item established

Infrastructure: Effective computing infrastructure, extensive support resource, general computer access

Stage 3: Professionalism

Leadership: Leaders committed and supportive in key areas & at the top

Funding: Mix of internal and external funding, funding more consistent

Infrastructure: More functional, more staff, greater access by students and faculty to computers

Stage 2: Expansion

Leadership: Gathering support by leaders, still uneven

Funding: A few grants and one-shot district funding

Infrastructure: Launched, limited services, some desktops

Stage 1: New Venture

Leadership: Gathering support by leaders, still uneven

Funding: A few grants and one-shot district funding

Infrastructure: Launched, limited services, some desktops

Fostering Instructional Technology

Instructional Technology Utilization	Professional Development Activities
Stage 4: Maturity	
Participants: Most of the faculty **Uses:** Student-centered design based on principles of good practice **Assessment:** Pervasive focus on student learning	**Focus:** Student outcomes & assessment; student collaboration and interaction **Delivery:** Individualized **Format:** Mostly local, fully staffed with campus trainers
Stage 3: Professionalism	
Participants: Inclusion of mainstream faculty users **Uses:** Discipline-specific, more focus on student learning **Assessment:** Idiosyncratic, dependent on faculty member	**Focus:** Course-specific software; websites, email, greater use of online technologies **Delivery:** Some group workshops but more individualized support and help **Format:** More local workshops and instruction
Stage 2: Expansion	
Participants: More early adopters, very few mainstream **Uses:** Course management & teaching delivery **Assessment:** Sporadic and superficial using mostly surveys	**Focus:** Course records, teaching delivery, PowerPoint **Delivery:** Training done mostly in groups **Format:** Regional and local workshops, summer institutes
Stage 1: New Venture	
Participants: More early adopters, very few mainstream **Uses:** Course management & teaching delivery **Assessment:** Sporadic and superficial using mostly surveys	**Focus:** Course records, teaching delivery, PowerPoint **Delivery:** Training done mostly in groups **Format:** Regional and local workshops, summer institutes

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New Venture

Crisis: Commitment

Expansion

Crisis: Leadership

Initial Stage of Technology Integration: New Venture

The initial challenge facing any new effort to integrate technology on the campus is one of Commitment. This challenge is multi-faceted. Commitment must be garnered from the institutional administration, from those responsible for the campus computing resources, and of course from the faculty itself. Further, commitment must be consistent, reliable and durable. The CSS Ethnographic study found that one of the colleges studied suffered because a few key individuals initially created commitment but did not sustain it because they left the college. New efforts at this college were dormant until new leaders arose who provided the necessary commitment and sustained it.

The key challenge in this stage is to identify the early adopters and mobilize them around the emerging leaders to generate enthusiasm and movement. External training and development resources are critical at this initial stage.

Stage 2: Expansion of Instructional Technology Integration

The critical challenge for this stage is one of Leadership. Leadership must emerge, consolidate and be able to handle the stress of expanding the services and resources associated with instructional technology. This means that the Leadership must solidify commitment from the institution, from the IT department and from the faculty. Further, the Leaders must mobilize the resources necessary to provide more services to more faculty and lay the foundation for institutionalizing the faculty development activities. A critical role to be performed by the leaders at this stage is to paint a vision that all can rally behind.

This vision can be supported or supplied by external sources such as statewide CCC projects. In the CSS Ethnographic Study, it was found that for one college, "@ONE's role was to support the early adopters and show the mainstream 'what was possible' at the Summer Institutes".

This stage is crucial to long-term success as the leaders have emerged and have begun to generate momentum but it is still with those inclined to new innovations (early adopters). The move to the next stage must happen in a timely manner in order to arrive at critical mass.

> Results from the CSS research suggest that regional training is effective in the early stages of development and that local training and coaching is most effective during the later phases of instructional technology development.

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Stage Three: Professionalism of Instructional Technolgy Efforts

The central challenge of this stage is one of Autonomy. This challenge is two-fold. First, various departments and individuals may have innovated in a vacuum and are 'doing their own thing,' often well. Supporting innovation while starting to discuss what works best for the college's audiences is critical. Faculty development activities and interventions must be implemented to attract and enlist the majority members of the faculty. That is, instructional technology utilization must move beyond the early adopters and out to the mainstream faculty. Second, the early adopters must be retained as part of the mainstream effort. That is, the faculty must feel that their needs are being addressed as individuals not as one homogeneous mass.

The CSS literature review and ethnographic study both show that as colleges and faculty transition from pioneering to integrating instructional technology across the curriculum, the need for locally provided and sustained training infrastructures becomes more critical. External resources can be used incrementally to augment or supplement the local resources but the control and central resource base must be at the local campus.

At this stage the faculty development efforts have significant resources, breadth of offerings and involve the majority of the faculty. Much work still needs to be done in terms of the use of technology for instructional purposes and to solidify the technical and organizational infrastructure.

Stage Four: Maturity of Instructional Technology in the Institution
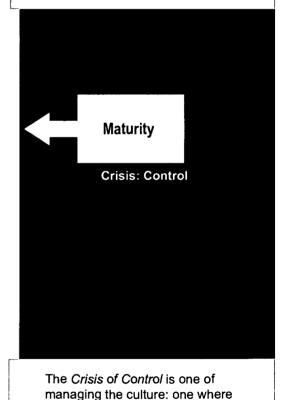
The central challenge of this stage is one of Control. The challenge is to address the need for individual faculty control in their classroom while establishing campus-based standards for technology utilization. Thus, attention must be given to individual faculty needs and voices, while planning and implementing instructional technology use based on students' needs and outcomes. The leaders of the professional development efforts must focus their attention on monitoring the changing face of technology and translating that to their constituents for use in the classroom. This suggests recurring needs assessment and considerable local communication across disciplines on campus. The ultimate goal for this stage is institutionalization of the instructional technology based on faculty developed and accepted standards.

The CSS research suggests that for this institutionalization to happen it is necessary to have the sustained commitment of the CEO, key administrators and Academic Senate leaders. Further it is necessary to have a growing IT infrastructure with IT leaders who understand student needs for learning and what the faculty needs to generate that learning. Finally, there needs to be a funding plan with a minimum annual percentage of the budget dedicated to learning technology.

At this stage the faculty development efforts are an institutional resource and are applied to ensure quality and consistency across the curriculum.

Professionalism

Crisis: Autonomy

The CSS ethnographic study indicated that by later stages of evolvement of campus instructional technology, the preferred training format changed from workshops that teach basic computer skills to sessions that help individual instructors integrate technology into a specific course. Intensive Institutes that use project based work to focus the training are particularly effective.

Maturity

Crisis: Control

The Crisis of Control is one of managing the culture: one where innovation is alive and risk-taking and risk-avoidance are in balance.

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The CSS Review of the literature underscores the need for developing training modalities that emphasize pedagogical principles and techniques as much as they teach technology. Such training modules should blend the tenets of evolving research in the domain of learning with the technical features embedded in various technologies.

Best Practices: Faculty Development in Higher Education

The preceding pages should assist key campus leaders in their understanding of the dynamics involved in a successful instructional technology effort. To assist in efforts to achieve mature effective faculty development programs, Best Practices derived from the CSS research are presented below. These practices are derived from the literature review but were largely confirmed in the ethnographic and survey studies.

1 *Training modules should blend pedagogical principles and technological features.* Training modules should be linked as much as possible to actual practical situations and should focus on pedagogical innovation and student learning.

2 *If possible, training should try to keep the technology transparent.* Training should allow faculty to pursue pedagogical and content goals without being hindered by prohibitive technology-learning curves.

3 *Training should be reinforced by follow-up to ensure that instructors are integrating what they learned into their teaching and curricula.* Local faculty development efforts are best positioned to provide continuous technical support and respond to questions and concerns.

4 *Learning from peers has been found to be highly effective in the academic environment.* Showcasing examples of successful integration of instructional technologies by other instructors, particularly those in the same discipline, should be a training approach pursued on a systematic basis.

5 *As in the delivery of instruction for students, faculty development in instructional technology should be "just-in-time" and on-demand* including virtual faculty development, electronic communities and self-paced faculty development. The "just-in-time" and on-demand requirements assume constant monitoring of faculty training needs.

In sum, local resources assume more importance as the faculty development efforts become more mature. In particular, local resources are better for handling one-on-one situations (coaching, support and assistance). State-wide or regional resources can be useful early on in the growth cycle as well as for providing on-demand and just-in time support through the provision of online resources.

6 *Training offered through summer institutes should cover a range of content such that faculty can have choices for intensive training.* This work should be in the form of project-based work directly related to the faculty's instructional responsibilities.

7 *Training by itself cannot accomplish much unless campuses provide an enabling technological environment* that emphasizes instructional technology integration throughout the curricula.

Assessment
Assessment programs should include formal and informal studies, quantitative and qualitative measures, classroom research and anecdotal evidence. Faculty should retain control of assessment of student learning outcomes with the role of researchers being one of support. A first step is for faculty in each discipline, and perhaps program, to identify what technology can do for student learning.

What is the Impact of Faculty Development?

The key question for faculty development in instructional technology is whether it has any impact on student learning or success. The CSS research through the survey study provides some insight into impact on faculty behaviors, attitudes and perceptions. It also provides information concerning faculty perceptions about impact on students. This information is summarized below.

Faculty Impact

With respect to faculty perceptions of what the technology training such as that from the @ONE project had enabled them to do, the clearest theme was that it had enabled them to *become better teachers*. While the responses varied from the general to the very specific, many of the faculty participants pointed to improvement in their teaching as the most important result of the @ONE technology training project. Other themes included *increasing confidence and facility with technology, becoming a technology facilitator for other faculty, and learning specific techniques and concepts*. Specific and personal examples of each of these themes were woven throughout the comments.

Student Impact

Faculty also perceived an effect of their participation in technology training on the students in their classrooms. Faculty perceived most clearly that the integration of the concepts and techniques of their @ONE training had the effect of enabling their students to *become better learners,* in a variety of ways. Additional themes to be found in faculty comments about the effect of their participation in @ONE training on students included increasing communication and class participation, *achieving better information access, obtaining more experience with technology, and having a richer learning experience.* Each of these themes is repeated throughout the comments by faculty, providing testimony to the positive effects they perceive that they have brought to their classroom, websites, and online experiences for students.

Specific types of **student behaviors** that faculty felt the students exhibited are:
- Search for answers to questions rather than ask instructor
- Apply what they are learning to real world questions
- Work in teams or groups
- Complete the course
- Take more responsibility for learning
- Participate more in class discussions
- Come to class more prepared
- Be more actively engaged with course material
- Express greater interest or satisfaction with the course

While it is likely that such behaviors would result in improved learning and a better educational experience, the study demonstrating this linkage has yet to be performed. The CSS research provided a crucial first step for more definitive research that would yield empirical data. Until that research is performed, the literature can only inform campus leaders about the many positive influences faculty development has on student learning processes.

The literature contains a wealth of information that emphasizes processes and organizational factors that enable the integration of information technologies throughout campuses and curricula. However, there is little in terms of discussion of the impact of faculty development in instructional technology on student learning outcomes.

Nevertheless, some authors found that instructional technology has many positive **influences** on student learning processes and outcomes, such as:
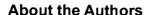
- use of instructional technology increases student interest and satisfaction
- the role of faculty and their ability to use instructional technology are major factors (hence, the need for training and continuous upgrading of skills); and
- certain instructional technology techniques better facilitate certain learning activities.

About This Briefing

This briefing is intended for campus leaders in the California Community Colleges who are concerned with how best to implement instructional technology to increase student learning and success. Using the latest research into the areas of instructional technology integration, professional development and organizational support conditions, the briefing lays out the natural progression that shapes the effectiveness of technology integration. Decision makers can use this progression to determine their institution's developmental stage and what steps need to be taken to move to the next level of development.

This briefing can be downloaded from the CCC Chancellor's Office website at the Telecommunications & Technology Unit page, http://www.cccco.edu/divisions/tris/telecom.htm, under Research and Reports.

About the Authors

William J. Doherty, PhD
Dr. Doherty is a Principal in Third Star Consulting & Education. He has over 25 years experience performing educational research and evaluation, focusing on the utilization of technology to foster and enhance human learning and growth. He can be contacted at bdoherty@third-star.com.

Catherine Ayers, M. Ed
Ms. Ayers is a Principal in Catherine Ayers & Associates. She has extensive experience in the California Community Colleges, research and professional development for improved performance. She can be contacted at cathayer@pacbell.net.

Graphic Design: Heidi King, Learning Technologies, Foothill-De Anza CCD

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