

Seven Principles for Good Practice in Undergraduate Education

by

Arthur W. Chickering and Zelda F. Gamson

Summary

Following is a brief summary of the Seven principles for Good Practice in Undergraduate Education as compiled in a study supported by the American Association of Higher Education, the Education Commission of the States, and The Johnson Foundation.

1. *Good Practice Encourages Student-Faculty Contact*

Frequent student-faculty contact in and out of classes is the most important factor in student motivation and involvement. Faculty concern helps students get through rough times and keep on working. Knowing a few faculty members well enhances students' intellectual commitment and encourages them to think about their own values and future plans.

2. *Good Practice Encourages Cooperation among Students*

Learning is enhanced when it is more like a team effort than a solo race. Good learning, like good work, is collaborative and social, not competitive and isolated. Working with others often increases involvement in learning. Sharing one's own ideas and responding to others' reactions improves thinking and deepens understanding.

3. *Good Practice Encourages Active Learning*

Learning is not a spectator sport. Students do not learn much just sitting in classes listening to teachers, memorizing pre-packaged assignments, and spitting out answers. They must talk about what they are learning, write about it, relate it to past experiences, and apply it to their daily lives. They must make what they learn part of themselves.

4. *Good Practice Gives Prompt Feedback*

Knowing what you know and don't know focuses learning. Students need appropriate feedback on performance to benefit from courses. In getting started, students need help in assessing existing knowledge and competence.

In classes, students need frequent opportunities to perform and receive suggestions for improvement. At various points during college, and at the end, students need chances to reflect on what they have learned, what they still need to know, and how to assess themselves.

5. *Good Practice Emphasizes Time on Task*

Time plus energy equals learning. There is no substitute for time on task. Learning to use one's time well is critical for students and professionals alike. Students need help in learning effective

time management. Allocating realistic amounts of time means effective learning for students and effective teaching for faculty. How an institution defines time expectations for students, faculty, administrators, and other professional staff can establish the basis for high performance for all.

6. Good Practice Communicates High Expectations

Expect more and you will get it. High Expectations are important for everyone - for the poorly prepared, for those unwilling to

exert themselves, and for the bright and well motivated. Expecting students to perform well becomes a self-fulfilling prophecy when teachers and institutions hold high expectations of themselves and make extra efforts.

7. Good Practice Respects Diverse Talents and Ways of Learning

There are many roads to learning. People bring different talents and styles of learning to college. Brilliant students in the seminar room may be all thumbs in the lab or art studio. Students rich in hands-on experience may not do so well with theory. Students need the opportunity to show their talents and learn in ways that work for them. Then they can be pushed to learning in new ways that do not come so easily.

Reprinted with permission from the AAHE Bulletin, March 1987

Apathetic students, illiterate graduates, incompetent teaching, impersonal campuses - so rolls the drum fire of criticism of higher education.

More than two years of reports have spelled out the problems. States have been quick to respond by holding out carrots and beating with sticks. There are neither enough carrots nor enough sticks to improve undergraduate education without the commitment and action of students and faculty members. They are the precious resources on whom the improvement of undergraduate education depends. But how can students and faculty members improve undergraduate education? Many campuses around the country are asking this question. To provide a focus for their work, we offer seven principles based on research on good teaching and learning in colleges and universities.

Good practice in undergraduate education:

- 1. Encourages student-faculty contact.*
- 2. Encourages cooperation among students.*
- 3. Encourages active learning.*
- 4. Gives prompt feedback.*
- 5. Emphasizes time on task.*
- 6. Communicates high expectations.*
- 7. Respects diverse talents and ways of learning.*

We can do it ourselves - with a little bit of help....

A Focus for Improvement

These seven principles are not ten commandments shrunk to a twentieth century attention span. They are

intended as guidelines for faculty members, students, and administrators - with support from state agencies and trustees - to improve teaching and learning. These principles seem like good common sense, and they are - because many teachers and students have experienced them and because research supports them. They rest on 50 years of research on the way teachers teach and students learn, how students work and play with one another, and how students and faculty talk to each other.

While each practice can stand on its own, when all are present, their effects multiply. Together, they employ six powerful forces in education:

- *Activity*
- *Diversity*
- *Interaction*
- *Cooperation*
- *Expectations*
- *Responsibility*

Good practices hold as much meaning for professional programs as for the liberal arts. They work for many different kinds of students - white, black, Hispanic, Asian, rich, poor, older, younger, male, female, well-prepared, under prepared.

But the ways different institutions implement good practice depends very much on their students and their circumstances. In what follows, we describe several different approaches to good practice that have been used in different kinds of settings in the last few years. In addition, the powerful implications of these principles for the way states fund and govern higher education and for the way institutions are run are discussed briefly at the end.

As faculty members, academic administrators, and student personnel staff, we have spent most of our working lives trying to understand our students, our colleagues, our institutions, and ourselves. We have conducted research on higher education with dedicated colleagues in a wide range of schools in this country. We draw the implications of this research for practice, hoping to help us all do better.

We address the teacher's how, not the subject-matter what, of good practice in undergraduate education. We recognize that content and pedagogy are present, their effects multiply. Together, they employ six powerful forces in education:

Activity Diversity Interaction Cooperation Expectations Responsibility

Good practices hold as much meaning for professional programs as for the liberal arts. They work for many different kinds of students - white, black, Hispanic, Asian, rich, poor, older, younger, male, female, well-prepared, under prepared. But the ways different institutions implement good practice depends very much on their students and their circumstances. In what follows, we describe several different approaches to good practice that have been used in different kinds of settings in the last few years. In addition, the powerful implications of these principles for the way states fund and govern higher education and for the way institutions are run are discussed briefly at the end.

As faculty members, academic administrators, and student personnel staff, we have spent most of our working lives trying to understand our students, our colleagues, our institutions, and ourselves. We have conducted research on higher education with dedicated colleagues in a wide range of schools in this country. We draw the implications of this research for practice, hoping to help us all do better.

We address the teacher's how, not the subject-matter what, of good practice in undergraduate education. We recognize that content and pedagogy interact in complex ways. We are also aware that there is much healthy ferment within and among the disciplines. What is taught, after all, is at least as important as how it is taught. In contrast to the long history of research in teaching and learning, there is little research on the college curriculum. We cannot, therefore, make responsible recommendations about the content of good undergraduate education. That work is yet to be done.

This much we can say: An undergraduate education should prepare students to understand and deal intelligently with modern life. What better place to start but in the classroom and on our campuses? What better time than now?

Prepared with the assistance of Alexander W. Astin, Howard Bowen, Carol M. Boyer, K. Patricia Cross, Kenneth Eble, Russell Edgerton, Jerry Gaff, Joseph Katz, C. Robert Pace, Marvin W. Peterson, and Richard C. Richardson, Jr.

This work was co-sponsored by the American Association for Higher Education and the Education Commission of the States. The Johnson Foundation supported a meeting for the authors at Wingspread in Racine, Wisconsin.

1. Encourages Student-Faculty Contact

Frequent student-faculty contact in and out of classes is the most important factor in student motivation and involvement. Faculty concern helps students get through rough times and keep on working. Knowing a few faculty members well enhances students' intellectual commitment and encourages them to think about their own values and future plans.

Some examples: Freshmen seminars on important topics, taught by senior faculty members, establish an early connection between students and faculty in many colleges and universities.

In the Saint Joseph's College core curriculum, faculty members who lead discussion groups in courses outside their fields of specialization model for students what it means to be a learner. In the Undergraduate Research Opportunities Program at the Massachusetts Institute of Technology, three out of four undergraduates have joined three-quarters of the faculty in recent years as junior research colleagues. At Sinclair Community College, students in the "College Without Walls" program have pursued studies through learning contracts. Each student has created a "resource group," which includes a faculty member, a student peer, and two "community resource" faculty members. This group then provides support and assures quality.

2. Encourages Cooperation

Learning is enhanced when it is more like a team effort than a solo race. Good learning, like good work, is collaborative and social, not competitive and isolated. Working with others often increases involvement in learning. Sharing one's own ideas and responding to others' reactions sharpens thinking and deepens understanding.

Some examples: Even in large lecture classes, students can learn from one another. Learning groups are a common practice. Students are assigned to a group of five to seven other students who meet regularly during class throughout the term to solve problems set by the instructor. Many colleges use peer tutors for

students who need special help.

Learning communities are another popular way of getting students to work together. Students involved in SUNY at Stony Brook's Federated Learning Communities can take several courses together. The courses, on topics related to a common theme like science, technology, and human values, are from different disciplines. Faculty teaching the courses coordinate their activities while another faculty member, called a "master learner," takes the courses with the students. Under the direction of the master learner, students run a seminar which helps them integrate ideas from the separate courses.

3. Encourages Active Learning

Learning is not a spectator sport. Students do not learn much just by sitting in classes listening to teachers, memorizing pre-packaged assignments, and spitting out answers. They must talk about what they are learning, write about it, relate it to past experiences, apply it to their daily lives. They must make what they learn part of themselves.

Some examples: Active learning is encouraged in classes that use structured exercises, challenging discussions, team projects, and peer critiques. Active learning can also occur outside the classroom. There are thousands of internships, independent study opportunities, and cooperative job programs across the country in all kinds of colleges and universities, in all kinds of fields, for all kinds of students. Students also can help design and teach courses or parts of courses. At Brown University, faculty members and students have designed new courses on contemporary issues and universal themes; the students then help the professors as teaching assistants. At the State University of New York at Cortland, beginning students in a general chemistry lab have worked in small groups to design lab procedures rather than repeat pre-structured exercises. At the University of Michigan's Residential College, teams of students periodically work with faculty members on a long-term original research project in the social sciences.

4. Gives Prompt Feedback

Knowing what you know and don't know focuses learning. Students need appropriate feedback on performance to benefit from courses. When getting started, students need help in assessing existing knowledge and competence. In classes, students need frequent opportunities to perform and receive suggestions for improvement. At various points during college, and at the end, students need chances to reflect on what they have learned, what they still need to know, and how to assess themselves.

Some examples: No feedback can occur without assessment. But assessment without timely feedback contributes little to learning.

Colleges assess students as they enter in order to guide them in planning their studies. In addition to the feedback they receive from course instructors, students in many colleges and universities receive counseling periodically on their progress and future plans. At Bronx Community College, students with poor academic preparation have been carefully tested and given special tutorials to prepare them to take introductory courses. They are then advised about the introductory courses to take, given the level of their academic skills.

Adults can receive assessment of their learning from work and other life experiences at many colleges and universities through a portfolio process or through standardized tests; these provide the basis for sessions with advisors.

Alverno College requires that students develop high levels of performance in eight general abilities such as

analytic, valuing, and communication skills. Performance is assessed and then discussed with students at each level of each ability in a variety of ways and by a variety of assessors.

In writing courses across the country, students are learning, through detailed feedback from instructors and fellow students, to revise and rewrite drafts. They learn, in the process, that feedback is central to learning and improving performance.

5. Emphasizes Time on Task

Time plus energy equals learning. There is no substitute for time on task. Learning to use one's time well is critical for students and professionals alike. Students need help in learning effective time management. Allocating realistic amounts of time means effective learning for students and effective teaching for faculty. How an institution defines time expectations for students, faculty, administrators, and other professional staff can establish the basis for high performance for all.

Some examples- Mastery learning, contract learning, and computer assisted instruction require that students spend adequate amounts of time on learning. Extended periods of preparation for college also give students more time on task. Matteo Ricci College is known for its efforts to guide high school students from the ninth grade to a B.A. in six years through a curriculum taught jointly by faculty at Seattle Preparatory School and Seattle University. Providing students with opportunities to integrate their studies into the rest of their lives helps them use time well.

Workshops, intensive residential programs, combinations of televised instruction, correspondence study, and learning centers are all being used in a variety of institutions, especially those with many part-time students. Weekend colleges and summer residential programs, courses offered at work sites and community centers, clusters of courses on related topics taught in the same time block, and double-credit courses make more time for learning. At Empire State College, for example, students design degree programs organized in manageable time blocks; students may take courses at nearby institutions, pursue independent study, or work with faculty and other students at Empire State learning centers.

6. Communicates High Expectations

Expect more and you will get more. High expectations are important for everyone - for the poorly prepared, for those unwilling to exert themselves, and for the bright and well motivated. Expecting students to perform well becomes a self-fulfilling prophecy when teachers and institutions hold high expectations of themselves and make extra efforts.

Some examples: In many colleges and universities, students with poor past records or test scores do extraordinary work. Sometimes they out-perform students with good preparation. The University of Wisconsin-Parkside has communicated high expectations for under prepared high school students by bringing them to the university for workshops in academic subjects, study skills, test taking, and time management. In order to reinforce high expectations, the program involves parents and high school counselors.

The University of California-Berkeley introduced an honors program in the sciences for under prepared minority students; a growing number of community colleges are establishing general honors programs for minorities. Special programs like these help. But most important are the day-to-day, week-in and week-out expectations students and faculty hold for themselves and for each other in all their classes.

7. Respects Diverse Talents and Ways of Learning

There are many roads to learning. People bring different talents and styles of learning to college. Brilliant students in the seminar room may be all thumbs in the lab or art studio. Students rich in hands-on experience may not do so well with theory. Students need the opportunity to show their talents and learn in ways that work for them. Then they can be pushed to learning in new ways that do not come so easily.

Some examples: Individualized degree programs recognize different interests. Personalized systems of instruction and mastery learning let students work at their own pace. Contract learning helps students define their own objectives, determine their learning activities, and define the criteria and methods of evaluation. At the College of Public and Community Service, a college for older working adults at the University of Massachusetts-Boston, incoming students have taken an orientation course that encourages them to reflect on their learning styles. Rockland Community College has offered a life-career-educational planning course. At the University of California, Irvine, introductory physics students may choose between a lecture-and-textbook course, a computer-based version of the lecture-and-textbook course, or a computer-based course based on notes developed by the faculty that allow students to program the computer. In both computer-based courses, students work on their own and must pass mastery exams.

Whose Responsibility is it?

Teachers and students hold the main responsibility for improving undergraduate education. But they need a lot of help. College and university leaders, state and federal officials, and accrediting associations have the power to shape an environment that is favorable to good practice in higher education.

What qualities must this environment have?

- *A strong sense of shared purposes.*
- *Concrete support from administrators and faculty leaders for those purposes.*
- *Adequate funding appropriate for the purposes.*
- *Policies and procedures consistent with the purposes.*
- *Continuing examination of how well the purposes are being achieved.*

There is good evidence that such an environment can be created. When this happens, faculty members and administrators think of themselves as educators. Adequate resources are put into creating opportunities for faculty members, administrators, and students to celebrate and reflect on their shared purposes. Faculty members receive support and release time for appropriate professional development activities. Criteria for hiring and promoting faculty members, administrators, and staff support the institution's purposes. Advising is considered important. Departments, programs, and classes are small enough to allow faculty members and students to have a sense of community, to experience the value of their contributions, and to confront the consequences of their failures.

States, the federal government, and accrediting associations affect the kind of environment that can develop on campuses in a variety of ways. The most important is through the allocation of financial support. States also influence good practice by encouraging sound planning, setting priorities, mandating standards, and reviewing and approving programs. Regional and professional accrediting associations require self-study and peer review in making their judgments about programs and institutions.

These sources of support and influence can encourage environments for good practice in undergraduate education by:

Setting policies that are consistent with good practice in undergraduate education.

Holding high expectations for institutional performance.

Keeping bureaucratic regulations to a minimum that is compatible with public accountability.

Allocating adequate funds for new undergraduate programs and the professional development of faculty members, administrators, and staff.

Encouraging employment of under-represented groups among administrators, faculty members, and student services professionals.

Providing the support for programs, facilities, and financial aid necessary for good practice in undergraduate education.

Selected References

Adelman, C. (1984) Starting with students: Promising approaches in American Higher Education. Washington, D.C.: National Institute of Education.

Astin, A. W (1977) Four critical years: Effects of college on beliefs, attitudes, and knowledge. San Francisco: Jossey-Bass.

Astin, A.W (1985) Achieving educational excellence. San Francisco: Jossey-Bass.

Bayer, A.E. (1975) Faculty composition, institutional structure, and students' college environment. Journal of Higher Education, 46 (5), 549-555.

Beal P.E. & Noel, L. (1980) What works in student retention. American College Testing Program.

Bouton, C. & Garth, R.Y (1983) Learning in groups, New Directions for Teaching and Learning, 14. San Francisco: Jossey-Bass.

Bowen H.R. (1977) Investment in learning. San Francisco: Jossey-Bass.

Boyer, C. M. & Ahlgren, A. (1987, July/August) Assessing undergraduates' patterns of credit distribution: Amount and specialization. Journal of Higher Education, 58 (4), forthcoming.

Boyer, C.M., Ewell, P.T., Finney, J.E., & Mingle, J.R. (1987) Assessment and outcomes measurement -A view from the states: Highlights of a new ECS survey. AAHE Bulletin, 39:7, 8-12,

Boyer, E.L. (1987) COLLEGE: The Undergraduate Experience in America, New York: Harper & Row.

Chickering, A.W. (1969) Education and identity, San Francisco: Jossey-Bass.

Chickering, A,W, & McCormick, J. (1973) Personality development and the college experience. Researching Higher Education, 1, 43-70.

Chickering, A.W (1974) Commuting versus resident students: Overcoming the educational inequities of living off campus. San Francisco: Jossey-Bass.

Chickering, A.W., & Associates (1981) The Modern American College: Responding to the New Realities of Diverse Students and a Changing Society. San Francisco: Jossey-Bass.

Claxton, C.S., & Ralston, Y (1978) Learning styles: Their impacts on teaching and administration. AAHE-ERIC/Higher Education, Research Report No. 10 Washington, D.C.: American Association for Higher Education.

Cohen, E.G. (1986) Designing groupwork: Strategies for the heterogeneous classroom. New York: Teachers College Press.

Cross, K.P (1986, March) Taking teaching seriously. Presentation at the Annual Meeting of the American Association for Higher Education.

Eble, K. (1976) Craft of teaching. San Francisco: Jossey-Bass.

Feldman, K.A. & Newcomb, T.M. (1969) The impact of college on students. San Francisco: Jossey-Bass.

Gamson, Z.F., & Associates (1984) Liberating education. San Francisco: Jossey-Bass.

Gardner, H. (1983) Frames of mind: A theory of multiple intelligence. New York: Basic Books.

Heath, D. (1968) Growing up in college. San Francisco: Jossey-Bass.

Jacob, R.E. (1957) Changing values in collage. New York: Harper.

Katz, J., & Associates (1968) No time for youth. San Francisco: Jossey-Bass.

Keeton, M.T. (Ed.) (1976) Experiential learning. San Francisco: Jossey-Bass.

Kolb, D. (1984) Experiential learning. New Jersey: Prentice Hall

Kulik, J.A. (1982) Individualized systems of instruction. In Harold E. Mitzel (Ed.), Encyclopedia of Educational Research, 2. New York: The Free Press.

Lowman, J. (1984) Mastering the techniques of teaching. San Francisco: Jossey-Bass.

McKeachie, W.J. (1985) Improving undergraduate education through faculty development. San Francisco: Jossey-Bass.

Messick, S., & Associates, (Ed.) (1976) Individuality in learning. San Francisco: Jossey-Bass.

Newcomb, T.M. (1943) Personality and social change. New York: Dryden Press.

Newcomb, T.M., and others. (1943) Persistence and change: A college and its students after twenty-five years. Huntington, New York: Krieger.

Pace, C.R. (1979) *Measuring outcomes of college: Fifty years of finding and recommending for future assessment*. San Francisco: Jossey-Bass.

Pascarella, E.T (1980) *Student-faculty informal contact and college outcomes*. *Review of Educational Research*, 50, Winter, 545-595.

Pascarella, E.T., Terenzini, P.T., & Wolfe, L.M. (1986) *Orientation to college and freshman year persistence/withdrawal decisions*. *Journal of Higher Education*, 57, 15-175.

Perry, W.G., Jr. (1970) *Forms of intellectual and ethical development in the college years: A scheme*. New York: Holt, Rinehart & Winston.

Peterson, M.W, Jedamus, P & Associates (1981) *Improving academic management*. San Francisco-Jossey-Bass.

Richardson, R.C., Jr., Fisk, E.C., & Okun, M.A. (1983) *Literacy in the open access college*. San Francisco: Jossey-Bass.

Sanford, N. (Ed.) (1962) *The American college*. New York: John Wiley & Sons.

Wallace, W.L. (1966) *Student culture*. Chicago: Aldine.

Wilson, R.C., Gaff, J. G., Dienst, E. R., Wood, L. & Bavry, J.L. (1975) *College professors and their impact upon students*. New York: John Wiley & Sons.

Winter, D.G., McClelland, D.C., & Stewart, A.J.(1981) *A new case for the liberal arts*. San Francisco: Jossey-Bass.

WINGSPREAD

"Seven Principles for Good Practice in Undergraduate Education" is a special insert to *The Wingspread Journal*, Volume 9, No. 2, published by The Johnson Foundation Post Office Box 547, Racine, Wisconsin 53401-0547, Susan Poulsen, editor.

Reprints of this special section are available in quantity at no charge. Write The Johnson Foundation at the address above.

June, 1987

6

The Seven Principles for Good Practice in Undergraduate Education were a huge success when they were first issued in the mid-1980s, and they have continued to be refined and used in a variety of ways since then.

Development and Adaptations of the Seven Principles for Good Practice in Undergraduate Education

Arthur W. Chickering, Zelda F. Gamson

Concern for improving undergraduate education has been unrelenting in the second half of the twentieth century. The two of us have been involved in many of these efforts and in the mid-1980s found ourselves in a position to pull together many of them under the rubric of Seven Principles for Good Practice in Undergraduate Education.

Origins of the Seven Principles for Good Practice

As one of the authors of “Involvement in Learning” (National Institute of Education, 1984), Gamson feared that this report and others that appeared within about a year of each other would not reach the faculty, administrators, and students to whom they were targeted (Bennett, 1984; Association of American Colleges and Universities, 1985; Newman, 1985). We both were members of the board of the American Association for Higher Education (AAHE), a broad-based national organization, and urged that it devote several of its national conferences to the improvement of undergraduate education. We also suggested that AAHE sponsor the development of a statement of the principles of a good undergraduate education.

Around the same time, we attended a conference at Wingspread, the conference center in Racine, Wisconsin, operated by the Johnson Foundation, which brought together the authors of several of the recent reports on undergraduate education along with other observers of higher education.

At this meeting, it became clear to us that the dissemination of a statement of principles could be timed to an undergraduate education reform movement that appeared to be sweeping the country.

All of the elements for this project were in place—two credible sponsoring organizations (AAHE and the Johnson Foundation), general discussion of the issues involved, and a broad-based national movement to improve undergraduate education. Drawing on the “principles of good practice in experiential learning” adapted from consumer groups by the Council on Adult and Experiential Learning (CAEL), an organization on whose founding board Chickering served and whose early history Gamson chronicled (Gamson, 1989), we decided to come up with a similar set of principles for undergraduate education.

How were we to generate such a statement? We wanted the statement to reflect the collective wisdom of the individuals who were most knowledgeable about the research literature. With support from the Johnson Foundation and the Lilly Endowment, we invited a small task force to meet for two days at Wingspread in the summer of 1986. The task force members included scholars who had conducted much of the research on the impact of the college experience as well as scholars of organizational, economic, and policy issues in higher education. The gathering was an extraordinary event in its own right. Though most of the participants knew one another’s work, they had never come together to trace their work’s implications for improving undergraduate education. We presented them with a number of principles we had drawn up ahead of time, with the caveat that they were to end up with no more than nine, preferably fewer.

We insisted that whatever we produced be accessible, understandable, practical, and widely applicable. Although everyone agreed that faculty were the primary audience, several task force members also felt that we should try to reach campus administrators, state higher education agencies, and government policymakers. The desire to reach multiple audiences reinforced the need to make the principles understandable and practical.

Development and Dissemination

The final version of the Seven Principles for Good Practice in Undergraduate Education was presented in the lead article in the March 1987 issue of the *AAHE Bulletin* (Chickering and Gamson, 1987). It said that good practice in undergraduate education

- Encourages student-faculty contact
- Encourages cooperation among students
- Encourages active learning
- Gives prompt feedback
- Emphasizes time on task
- Communicates high expectations
- Respects diverse talents and ways of learning

The response to the article was immediate and overwhelming, and it was soon republished as a special section in the June 1987 issue of the *Wingspread Journal*. More than 150,000 copies of the seven principles were ordered from the Johnson Foundation, and an untold number were copied or reprinted in other publications, such as newsletters of national associations and campus centers for teaching and learning.

We felt encouraged enough by the enthusiastic response to the statement of the principles to develop a self-assessment instrument for faculty members, with examples and indicators of each of the principles. We also decided to produce a second instrument with indicators of campus practices and policies in support of the seven principles. After much testing and circulating of ideas, inventories of good practice were published in 1989 by the Johnson Foundation in two handy self-assessment booklets (Chickering, Gamson, and Barsi, 1989).

The response to the inventories was again overwhelming. Within a week of publication, forty thousand were gone. After several printings, their distribution was taken over by Winona State University, which had established the Seven Principles Resource Center. Accounts of the seven principles and their adaptations and uses have appeared regularly since (Gamson and Poulsen, 1989; Heller, 1989; Chickering and Gamson, 1991; Hatfield, 1995). A veritable industry of commentary, research, and adaptation has followed.

Adaptations

We are aware of only some of the adaptations of the seven principles and do not intend to be exhaustive in those we present here, although they do illustrate the variety of follow-up activities and works in progress. The principles and the inventories have been incorporated in, adapted in, or used as the springboard for several similar assessment and research instruments. The earliest is the Student Inventory, available from the Seven Principles Resource Center at Winona State, which asks students to rate themselves according to indicators of each of the principles. Another student-oriented adaptation is the Seven Principles for Good Practice in Student Affairs, a collaborative effort of the American College Personnel Association and the National Association of Student Personnel Administrators.

The College Student Experiences Questionnaire is a well-developed research tool containing indicators that can be adapted to measure several of the seven principles. A new edition now includes some items that address more of the principles. This questionnaire has been used in several studies (Kuh and Vesper, 1997; Kuh, Pace, and Vesper, 1997).

Richard Webster at the Fisher College of Business, Ohio State University, has created the Learning Process Inventory and Assessment (LPIA), a survey-guided assessment based on the seven principles and the faculty, institutional, and student inventories. According to Webster, "The LPIA is a tool for helping faculty members communicate their subject matter to their students (that is, teaching content and teaching processes) and for

helping students take more responsibility for . . . learning course content and managing their own learning process in more effective ways. This transfer of responsibility from teacher, instructor, or trainer to learner is one key to learning communities, in K–12, in higher education, and on the job” (personal communication, 1998).

Peter Ewell and his associates at the National Center for Higher Education Management Systems (NCHEMS) have incorporated the seven principles into a larger list of good practices (Ewell and Jones, 1996). These adaptations have appeared in an influential report issued by the Education Commission of the States, *Making Quality Count in Undergraduate Education* (1995). The report refers to twelve attributes of quality in undergraduate education:

- The organizational culture must have (1) high expectations, (2) respect for diverse talents and learning styles, and (3) an emphasis on the early years of study.
- A quality curriculum requires (4) coherence in learning, (5) synthesis of experiences, (6) ongoing practice of learned skills, and (7) integration of education and experience.
- Quality instruction incorporates (8) active learning, (9) assessment and prompt feedback, (10) collaboration, (11) adequate time on task, and (12) out-of-class contact with faculty.

Building on this work, Ewell led the creation of a survey of student engagement (National Survey of Student Engagement, n.d.), intended to provide information about the extent to which colleges and universities exhibit characteristics and commitments to high-quality undergraduate student outcomes. The results of the survey will be used to help colleges and universities improve the quality of their performance and offer data for making informed judgments to external assessors such as accrediting bodies and government agencies, as well as parents, students, and the media.

Applications

A variety of applications by institutions and individuals complement these adaptations of the principles and inventories. Perhaps the most systematic and extensive is described by Chuck Worth, director of institutional research at California State University, Chico. Worth reports:

The seven principles have been broadly distributed and widely used. . . . This has been part of our overall university effort in strategic planning. The heart of our academic mission and the first goal of our strategic plan is student-centered learning. . . . It has been given to deans with encouragement to discuss [it] . . . with chairs and faculty. It has also been distributed and discussed at university leaders’ strategic planning retreats, consisting of chairs, deans, academic senators, and key faculty. . . . Our president and provost gave two

\$5,000 awards in a first annual recognition of an Outstanding Commitment to the Development of Student-Centered Learning Environments. A memo to all faculty and staff specifically mentioned the seven principles as a guide and partial criteria for the awards [personal communication, 1998].

The university has also used the seven principles in orientations for new faculty, in instruments for student assessment of the learning environment, and in student focus groups.

The seven principles have guided inquiry into the educational consequences of new communication and information technologies. At George Mason University, for example, a faculty technology survey asked whether computer technology encourages contact between faculty and students, encourages cooperation among students, and so on through the list of principles. The Flashlight Project, which uses the seven principles along with other ways of evaluating the impact of technology on student learning, offers opportunities for faculty to engage in discussions about technology (Chickering and Ehrmann, 1996). Karen Gentemann in the Office of Institutional Assessment at George Mason writes that in using the Flashlight Project materials, she has “been encouraging faculty to read some of the articles in which the principles are discussed” (personal communication, 1998).

The seven principles have also been deployed in professional development workshops. Peter Frederick, a professor of history at Wabash College, describes how he uses them: “I have used the seven principles as a standard first page for probably well over a hundred workshops I have done in the past decade throughout the nation. . . . The workshops are variously titled: ‘Active Learning in the Classroom,’ ‘Revitalizing Traditional Forms of Teaching and Learning,’ ‘Empowering Learners for a Diverse Democratic Society.’ The workshops are almost always interactive, [a format that allows me to] model the principles. . . . What prompted me to use them? They are pithy and make sound pedagogical sense. Pithiness is important for faculty, who do not want much educational theory” (personal communication, 1998). George Kuh, professor of higher education at Indiana University, who has used the seven principles “at least fifty times in presentations over the past few years,” comments that “people always copy them down from the overhead and want copies” (personal communication, 1998).

Finally, we know about some of the individual faculty members who have applied the principles (Chickering and Gamson, 1991; Hatfield, 1995). An example is Jane Fraser, a professor of industrial and systems engineering at Ohio State University, who reports:

I have always tried to discuss my teaching methods with students. . . . I used the seven principles for a discussion of my teaching methods this quarter. I handed out the list to the class and also had the list on an overhead. I went through each principle, discussing how I am trying to accomplish it. I then discussed how each principle can be turned into a point of good learning—actions a student should take, not just actions the professor should take. . . .

Finally, I opened the discussion . . . about what principles they would add to the list. [The students] had some very good suggestions, especially along the lines that good practice involves conveying enthusiasm and presenting material in interesting ways [personal communication, 1998].

Research

The seven principles have inspired several lines of research. John Braxton and his colleagues looked at the tendency of different academic disciplines to enact the seven principles (Braxton, Olsen, and Simmons, 1998). They found that disciplines with “low paradigmatic development,” such as history, psychology, and sociology—fields in which faculty are not in much agreement about the theory methods, techniques, and problems that are characteristics of the discipline—use four of the seven principles in their teaching: encouragement of student-faculty contact, encouragement of active learning, communication of high expectations, and respect for diverse talents and ways of knowing. George Kuh and his colleagues report on two studies based on the seven principles using the College Student Experiences Questionnaire. In a study of students’ experiences at baccalaureate institutions and at doctoral degree granting universities, Kuh and Vesper (1997) found that students at the former reflected a positive effect of the seven principles, especially through increased faculty-student interaction between 1990 and 1994, and that students at the universities did not. In another study, Kuh, Pace, and Vesper (1997) found that faculty-student contact, cooperation among students, and active learning were the best predictors of student educational gains in college.

We are pleased that the seven principles have inspired such research and encourage others to make use of both the principles and the inventories in carrying out studies of teaching practices, student learning, faculty, disciplines, and institutions. Our greatest impact, however, is on individual faculty members and on institutions. As George Kuh pointed out to us, “There are many of your apostles out there who are translating and interpreting the principles as policies and practices are evaluated and developed. . . . You can see the images of these principles reflected in many of the initiatives we have under way on my campus and elsewhere. So [even if] folks may not be wearing a laminated SEVEN PRINCIPLES card around their necks, the principles have and will continue to have a substantial impact” (personal communication, 1998).

References

- Association of American Colleges and Universities. *Integrity in the College Curriculum: A Report to the Academic Community*. Washington, D.C.: Association of American Colleges and Universities, 1985.
- Bennett, W. J. *To Reclaim a Legacy: A Report on the Humanities in Higher Education*. Washington, D.C.: National Endowment for the Humanities, 1984.

- Braxton, J. M., Olsen, D., and Simmons, A. "Affinity Disciplines and the Use of Principles of Good Practice for Undergraduate Education." *Research in Higher Education*, 1998, 39(3), 299–318.
- Chickering, A. W., and Ehrmann, S. C. "Implementing the Seven Principles: Technology as a Lever." *AAHE Bulletin*, 1996, 49(2), 3–6.
- Chickering, A. W., and Gamson, Z. F. "Seven Principles for Good Practice in Undergraduate Education." *AAHE Bulletin*, 1987, 39(7), 3–7.
- Chickering, A. W., and Gamson, Z. F. (eds.). *Applying the Seven Principles for Good Practice in Undergraduate Education*. New Directions for Teaching and Learning, no. 47. San Francisco: Jossey-Bass, 1991.
- Chickering, A. W., Gamson, Z. F., and Barsi, L. *Inventories of Good Practice*. Milwaukee, Wis.: Johnson Foundation, 1989.
- Education Commission of the States. *Making Quality Count in Undergraduate Education*. Denver, Colo.: Education Commission of the States, 1995.
- Ewell, P., and Jones, D. *Indicators of "Good Practice" in Undergraduate Education: A Handbook for Development and Implementation*. Boulder, Colo.: National Center for Higher Education Management Systems, 1996.
- Gamson, Z. F. *Higher Education and the Real World: The Story of CAEL*. Wolfeboro, N.H.: Longwood Academic, 1989.
- Gamson, Z. F., and Poulsen, S. J. "Inventories of Good Practice: The Next Step for the Seven Principles for Good Practice in Undergraduate Education." *AAHE Bulletin*, 1989, 47(3), 708–714.
- Hatfield, S. R. (ed.). *The Seven Principles in Action: Improving Undergraduate Education*. Bolton, Mass.: Anker, 1995.
- Heller, S. "Delighted Authors Find Their Agenda for Education Is a Huge Hit." *Chronicle of Higher Education*, Dec. 13, 1989, pp. A41, A43.
- Kuh, G. D., and Vesper, N. "A Comparison of Student Experiences with Good Practices in Undergraduate Education Between 1990 and 1994." *Review of Higher Education*, 1997, 21(1), 43–61.
- Kuh, G. D., Pace, C., and Vesper, N. "The Development of Process Indicators to Estimate Student Gains Associated with Good Practices in Undergraduate Education." *Research in Higher Education*, 1997, 38(4), 435–454.
- National Institute of Education. *Involvement in Learning: Realizing the Potential of American Higher Education*. Washington, D.C.: U.S. Department of Education, 1984.
- National Survey of Student Engagement. *The College Student Report*. Bloomington: National Survey of Student Engagement, Indiana University, n.d.
- Newman, F. *Higher Education and the American Resurgence*. Princeton, N.J.: Carnegie Foundation for the Advancement of Teaching, 1985.

ARTHUR W. CHICKERING is visiting distinguished professor at Vermont College, Norwich University, Montpelier, Vermont; senior associate in the New England Resource Center of Higher Education; and visiting professor of higher education at the University of Massachusetts, Boston.

ZELDA F. GAMSON is senior associate and founding director of the New England Resource Center for Higher Education and professor emeritus at the University of Massachusetts, Boston.

The Seven Principles of Good Practice: A framework for evaluating on-line teaching

Arthur W. Bangert*

Department of Education, Montana State University, 134 Reid Hall, Bozeman, MT 59717, United States

Received 18 May 2004; received in revised form 21 June 2004; accepted 21 June 2004

Abstract

Traditionally, campus-based courses rely on student evaluations to provide instructors with feedback about their teaching effectiveness. However, current instructor evaluation instruments do not tap the essential teaching practices recommended for effective on-line teaching. This exploratory study used the Seven Principles of Good Practice of Chickering and Gamson [*AAHE Bull.* 39 (1987) 3] to design a 35-item questionnaire to assess the effectiveness of an Internet-based educational statistics course. Results from the questionnaire indicated that most learners perceived that the instructor used constructivist-based principles to effectively promote student learning and that the course was a valuable learning experience. Instructional practices identified for improvement included the creation of more stimulating discussion questions and better instructor monitoring of study groups to ensure equal participation.

© 2004 Elsevier Inc. All rights reserved.

Keywords: On-line teaching effectiveness; Internet-based statistics; Student evaluations of teaching

1. Introduction

Internet-based instruction is becoming a commonplace practice for delivering coursework to students enrolled in higher education programs of study. As technology advances and student enrollments increase, many universities are exploring the use of on-line instruction to meet the demands of students

* Tel.: +1 406 994 7424; fax: +1 406 994 3216.

E-mail address: abangert@montana.edu.

who prefer or find it necessary to take classes at a distance. The number of institutions offering on-line instruction continues to grow as does the number of students desiring nontraditional delivery methods of instruction. The convenience of Internet-based course offerings has attracted many students to virtual campuses across the United States. More than 350,000 students enrolled in fully on-line degree-granting programs during the 2002 academic year, about 2% of all students enrolled in postsecondary education in the United States (Gallager & Newman, 2002). According to Gallager and Newman (2002), during this same time period, the estimated tuition revenues for Internet-delivered courses was US\$1.75 billion dollars, suggesting that offering on-line degree programs is a good business decision for most institutions.

The significant growth in the number of on-line degree programs is not surprising, considering that many students want to take courses that will have positive impacts on future careers but will still allow them to sustain family and work responsibilities. There has been concern among educators that quality assurance procedures for the design and delivery of Internet-based courses have been ignored, as colleges and universities rush to offer an array of distance-delivered programs that will allow them to maintain and grow enrollments (Motiwalla & Tello, 2000; Phipps, Wellman, & Merisotis, 1998). Despite the increase in the number institutions offering on-line degree programs, little is known about the teaching practices that contribute to effective on-line course design and delivery (Billings, 2000; Phipps & Merisotis, 2000). Research pertaining to effective teaching practices for Internet-based courses is just beginning to emerge as its own unique field of study.

1.1. Constructivist models of learning and on-line instruction

Constructivist models of learning are almost exclusively recommended as a guide for the design and delivery of Internet-based courses (e.g., Bonk & Cunningham, 1998; Jonassen, 2000; Partlow & Gibbs, 2003). The constructivist model of learning is premised on the notion that learners actively construct their own meaning and knowledge from their experiences (Svinicki, 1999). This learning paradigm views teaching as a process that involves helping learners to create knowledge through interactive and authentic learning experiences (Partlow & Gibbs, 2003). The teacher's role is to guide students toward experiences that will facilitate meaningful learning. Direct instructional activities where students passively assimilate knowledge are minimized. Key features of constructivist learning environments include active learning, authentic instructional tasks, collaboration among students, and diverse and multiple learning formats (Partlow & Gibbs, 2003).

Internet-based teaching experts suggest that active learning and collaboration are supported through learner-centered curricula that encourages discovery learning through the use of authentic instructional activities and interactive communities of learners (Giguere & Minotti, 2003). Hacker and Niederhauser (2000) point out that authentic examples, judicious feedback, and enhanced self-efficacy, in addition to active and collaborative learning strategies, are essential ingredients of Internet-based courses that are capable of promoting *deep and durable* learning. Research conducted by Partlow and Gibbs (2003) offers support for many of constructivist-based teaching practices that have been proposed for effective Internet-based instruction. Their research identified 10 major categories of constructivist-compatible teaching principles recognized as essential for effective on-line course design and delivery. Seven of the 10 categories representing the majority of instructional practices included project-based learning tasks, cooperative group work, infrequent use of direct instruction, tasks that require higher order thinking, interactivity, and learner choice. Partlow and

Gibbs' research provides valuable insights for guiding teaching practices that support effective on-line learning environments. However, this research effort only begins to inform the knowledge base desperately needed by new and veteran on-line course instructors. As on-line course offerings continue to flourish, conclusive research is needed to validate the effectiveness of teaching practices that have been identified as essential for the design and delivery of quality Internet-based courses (Phipps & Merisotis, 2000).

1.2. Student evaluations of teaching

Student evaluations of teaching are commonly used to provide instructors with feedback about the quality of their instruction. The validity of instructor evaluations, however, is dependent on the technical adequacy and content validity of the items written to operationalize the construct of teaching effectiveness (Marsh, 1997). The Students' Evaluation of Educational Quality (SEEQ; Marsh, 1982) and the Arizona Course/Instructor Evaluation Questionnaire (CIEQ; Aleamoni, 1978) are examples of student evaluation of teaching instruments frequently used in higher education. Extensive research studies provide evidence of the technical adequacy and validity of both the SEEQ and the CIEQ for assessing teaching effectiveness for campus-based courses (e.g., Aleamoni, 1999; Marsh, 1997). However, the development of the SEEQ and CIEQ occurred over 20 years ago, when student and faculty experiences with electronic learning environments were almost nonexistent and recommendations for effective electronic delivery of instruction were virtually unknown. Without revisions, it is doubtful that traditional student evaluations of teaching instruments are capable of adequately tapping the constructivist-based instructional practices that have been identified as vital for effective on-line instruction.

Very few questions comprising the SEEQ or CIEQ were written to capture constructivist-compatible teaching practices. The SEEQ does attempt to elicit student perceptions of group interaction through the questions, such as "Students were encouraged to participate in class discussions" and "Students were invited to share their ideas and knowledge." Even the question, "The course was intellectually challenging and stimulating" might be construed as an attempt to elicit student perceptions of the use of instructional techniques that endorse self-regulated learning. However, other questions, such as "The instructor gave lectures that facilitated taking notes," are irrelevant to on-line teaching practices. Moreover, traditional evaluation of teaching instruments like the SEEQ contain very general questions that do not specifically address instructional methods that have been identified as essential for effective on-line teaching. Contemporary instruments designed to assess the construct of teaching effectiveness do not adequately tap the constructivist-based instructional practices that have been identified as vital for effective on-line instruction.

Abrami, d'Apollonia, and Cohen (1990) suggest that student perceptions of effective teaching are highly dependent on the context in which instruction is delivered. The unique differences that separate on-line from traditional, campus-based instruction suggest that positive outcomes for these two distinct types of learning environments are dependent on different conditions (Relan & Gillani, 1997). The failure of traditional student evaluation of teaching instruments to adequately reflect essential learner-centered teaching practices calls into question the appropriateness of their use for evaluating on-line instruction. As more faculty accept the responsibility for delivering courses via the World Wide Web, it is imperative that new instruments are developed and validated for supplying on-line instructors with accurate feedback about their teaching effectiveness.

1.3. *The seven principles of effective teaching*

During the past 75 years, thousands of research studies have been conducted to provide insights into the complex array of variables that impact student learning in college (Cross, 1999). These studies have been synthesized into large volumes of information and position papers that highlight best practice for effectively delivering classroom instruction (e.g., American Psychological Association [APA], 1997; Pascarella & Terenzini, 1991). One of the best-known summaries of research-based instructional practices is the widely disseminated list of Seven Principles of Effective Teaching authored by Chickering and Gamson (1987). The *Seven Principles* emerged from a panel of higher education scholars asked to derive from their knowledge and experience a set of principles that could be applied to improve learning. As a result of this panel's work, Chickering and Gamson concluded that student success is related to effective teaching practices that encourage (1) student–faculty contact, (2) cooperation among students, (3) active learning, (4) prompt feedback, (5) time on task, (6) high expectations, and (7) respect for diverse talents and ways of learning.

The majority of the learner-centered instructional practices that comprise the Seven Principles framework are clearly focused on constructivist-based teaching practices. For example the principle of active learning suggests that effective teaching engages students in authentic learning activities that require them to select, organize, and integrate their experiences with existing knowledge to create new cognitive schema (Hacker & Niederhauser, 2000). Authentic instructional activities that include simulations, case-based examples, and other problem-solving exercises not only increase interactive learning but also support the principle of high expectations. Clear performance expectations that accompany authentic instructional activities inform students of the criteria necessary for demonstrating acceptable and proficient levels of performance. When performance expectations for authentic exercises are clearly communicated, students not only have a better understanding of the criteria required for successful performance but also gain insights about expected performances necessary for real-world problem solving (Magnani, Nersessian, & Thagard, 1999; Vye, Schwartz, Bransford, Zech, & CTGVT, 1998). The principle of cooperation among students is aligned with the constructivist notion that social interaction enhances learning (Svinicki, 1999). A deeper understanding of concepts occurs when students have opportunities to talk, listen, and reflect with their peers as they engage in problem-solving exercises that require them to apply newly acquired knowledge and skills (Millis & Cottrell, 1998).

Constructivists assert that learners are responsible for taking control and ownership for their learning (Jonassen, 2003). The principle of prompt feedback encourages students to be responsible learners by promoting self-efficacy (Bandura, 1986) or confidence in their abilities to successfully accomplish learning tasks. Research has demonstrated that self-efficacy increases when students are supplied with immediate and frequent performance feedback (Schunk, 1983). When perceived self-efficacy is high, students are more likely to engage in effective self-regulatory strategies that enhance academic achievement. Confident students take responsibility for creating meaningful learning experiences by efficiently monitoring their academic work time, persisting on tasks when confronted with academic challenges, and accurately monitoring the quality of their work through frequent self-evaluations (Pajares, 2002). Improved learner self-efficacy is necessary for supporting the principle of time on task because students who are confident about their skills maintain the academic persistence necessary for high levels of academic achievement (Lent, Brown, & Larkin, 1984; Pinitrich & DeGroot, 1990).

Encouraging diverse and multiple ways of learning suggests that knowledge acquisition is a unique experience for each learner (Svinicki, 1999). Students bring a diverse range of academic talents, preferences, and experiences to instructional environments. Allowing students to choose the pathways they will follow to achieve learning goals is necessary for self-regulated learning and an increased sense of self-efficacy. The practice of allowing students to choose instructional activities that are aligned with their unique learning styles, academic strengths, and interests further contributes to learner self-efficacy.

The constructivist-based teaching practices recommended by the Seven Principles framework are well suited for guiding the design and delivery of quality Internet-based instruction (Billings, 2000; Graham, Caglitay, Lim, Craner, & Duffy, 2001). However, manipulating the existing technology in a manner that effectively operationizes these best practices for effective instruction may be perceived as a significant challenge. Chickering and Erhmann (1996) dispel this notion by emphasizing that the newest versions of course authoring tools allow faculty to create easily the kinds of instructional activities recommended by the Seven Principles' framework. What must be emphasized here is that the pedagogy implicitly defined by the Seven Principles framework will ultimately determine the effectiveness of on-line teaching and not the technology associated with course authoring tools (Reeves & Reeves, 1997).

The Seven Principles framework offers solid, research-based guidance for the design and delivery of Internet-based courses. However, feedback specific to the effectiveness of on-line teaching practice would be of even more value to faculty. This case study explored the use of a student evaluation of teaching questionnaire specifically constructed to assess the quality of on-line teaching. The items for this instrument were written to reflect the constructivist-based teaching practices recommended by the Seven Principles of Effective Teaching. Graduate students enrolled in an on-line educational statistics course used this course evaluation tool to rate the instructor's on-line teaching effectiveness.

2. Method

2.1. Participants

The participants for this study were graduate students ($n=24$) enrolled in EDCI 402: Educational Statistics I at Montana State University. EDCI 402 is required for all students seeking a master's degree from the college of Education and Human Development. Almost all of the students (96%) enrolled were education majors (i.e., Educational Leadership, Counseling, Family and Consumer Science, and Curriculum and Instruction), while the remaining 4% were seeking degrees in Agricultural Education. Thirty-three percent of the students enrolled in EDCI 402 indicated that they had taken a previous course through WebCT.

2.2. Course content and design

The broad learning goals for EDCI 402 included understanding and applying descriptive and inferential statistics through one-way analysis of variance (ANOVA), demonstrating data analysis skills using statistical software, and interpreting the results of statistical analyses. The required texts

and software were *Statistics for the Behavioral Sciences* (Gravetter & Wallnau, 2004), *A Simple Guide to SPSS for Windows* (Kirkpatrick & Feeney, 2003), and the student version of the Statistical Package for the Social Sciences version 11.0 (SPSS, 2002). WebCT version 3.6 was the course authoring tool used to design and deliver EDCI 402. The WebCT content modules were used to present following topics: introduction to statistics and frequency distributions; central tendency; variability, introduction to SPSS; z scores and probability, sampling distributions and hypothesis testing, t tests, ANOVA, correlation, linear regression, chi-square; effect size; and choosing appropriate statistical analyses.

2.3. Procedures

The questionnaire designed for this study consisted of items based on constructivist-compatible learning principles aligned with the Seven Principles of Effective Teaching. Items were worded specifically to reflect the intent of the question within the context of on-line learning environments. Student responses were elicited using a six-point Likert-type scale ranging from *strongly agree* (6) to *strongly disagree* (1). In addition, seven open-ended questions were administered to capture more individualized and detailed perceptions of teaching effectiveness. Content validity of the instrument was established by a panel of college and university on-line instructors who reviewed the items for clarity, accuracy, and appropriateness for assessing on-line teaching practices. Items were reviewed and revised based on recommendations made from the review panel. The 35-item questionnaire was administered through the WebCT Quiz tool during the last two weeks of the spring 2004 semester. Twenty-four of the 26 students enrolled in the course completed the questionnaire. The 35-item questionnaire was found to be highly reliable, yielding an internal consistency reliability of .94. The final version of the questionnaire and a summary of student responses are presented in Table 1 (see Appendix A).

3. Results and discussion

3.1. Encourages student–faculty contact

Student-faculty contact has been identified as a critical factor for motivating students toward peak performance. Instructor characteristics such as friendliness, interest in student learning, enthusiasm, good communication skills, and accessibility to students have been identified as having a positive impact on the relationships between students and faculty (Chickering & Erhmann, 1996; Marsh, 1982; Young & Shaw, 1999). These attributes create a classroom climate where students feel comfortable approaching the instructor for help when encountering difficult course assignments. Instructor comments that are delivered in a supportive and nonthreatening manner motivate students to complete tasks resulting in higher levels of achievement.

The WebCT email tool was used primarily to maintain personal communications with individuals, as well as with collaborative study groups. Email messages were used to distribute announcements, clarify assignments, supply in-depth explanation of statistical concepts, and respond to inquiries related general course information. Email communications were particularly helpful for conveying specific instructions about how to use various WebCT tools. For example, email was used to clarify directions for uploading

assignment files through the WebCT assignment tool. The instructor also interacted with individual students and study groups through threaded discussions designed to stimulate dialog related to the application of various statistical concepts. Efforts to maintain productive interactions between learners and faculty were also supported through individual student–instructor meetings that were held during regularly scheduled instructor office hours.

Overall, students perceived that interactions with the instructor were encouraged and maintained throughout their on-line course experience. The majority of students felt that the instructor communicated effectively (92%), personalized interactions (96%), and was accessible (88%). In addition, most students felt that the instructor was concerned about student learning (96%), was respectful of student learning (100%), and enthusiastic about on-line teaching (90%). One student commented, “He [the instructor] was very helpful and willing to meet any time. It helped with taking on-line courses. He was very enthusiastic and interested in the learning process.” Another student noted, “The instructor was amazing; he stayed in constant communication and encouraged understanding and not timelines.”

3.2. Encourages cooperation among students

The constructivist model of instruction supports the notion that social interaction promotes student learning (Astin, 1993; Cooper & Mueck, 1990; Johnson, Johnson, & Smith, 1991). Improved thinking and deeper understanding occur when students have the opportunity to share and respond to each other’s ideas (Chickering & Gamson, 1996). Students were divided into six study groups that were responsible for collaboratively solving and submitting weekly problems designed to illustrate applications of the statistical concepts. The WebCT discussion tool was used to create private discussion rooms where each study group could post their work, compare and discuss each other’s solutions, and compose a final document with solved problems for submission to the instructor. Chat rooms were also created so that learners could synchronously discuss weekly problems with study group members or other members of the class. Two study groups reported meeting physically to complete weekly problems. However, the other study groups collaborated electronically because students within these groups lived far from campus or maintained schedules that did not permit meeting outside of the WebCT course room.

Results from items written to assess “cooperation among students” indicate that a high percentage of students perceived that the course was designed to promote cooperative learning activities (96%), encouraged students to interact with one another (96%), and allowed students to discuss assignments with their peers (92%). It is clear from student responses that cooperative learning activities were included as an instructional strategy. However, there were mixed perceptions of the effectiveness of these instructional activities. One student wrote, “I enjoyed working in groups. The group work really facilitated a greater understanding of statistics.” However, a frustrated response from another student expressed, “The way the class is structured, there is little [individual student] accountability. Someone can skate by while everyone else does the work.”

3.3. Active learning

Current versions of course authoring tools support the creation of Internet-based courses that have greater availability and accessibility to various forms of media supported by World Wide Web. The

capabilities for incorporating audio, video, and links to other virtual worlds allow instructors to create authentic, interactive problem-solving activities that augment student efforts to actively construct meaningful knowledge (Pahl, 2003). EDCI 402 incorporated problem-solving activities that involved the use of interactive statistical software and Internet-based simulations focused on the application and use of statistical concepts. SPSS 11.0 was used to conduct data analyses for case-based exercises designed to simulate realistic statistical applications. For example, the concept of chi-square was taught by requiring students to determine if there were significant increases in the percentage of fourth graders reaching proficiency on a statewide reading assessment. The context of this problem is current and realistic because the *No Child Left Behind* (2001) legislation requires school districts and states to perform a similar analysis for reporting *Adequate Yearly Progress* toward reading and mathematics goals.

The content modules contained links to web sites that learners could interact with to obtain visual representations of statistical concepts and gain experience using various analyses to solve applied problems. The *Hyperstat Online Statistics Textbook* (Lane, 2004) and interactive Java Applets were used frequently to supplement weekly presentations. A Java Applet created by Ogden (2003) was especially useful for providing students with a visual demonstration of the concept of statistical power. This applet allowed students to enter different combinations of means for two independent groups and visualize the changes in the overlap of the two sample distributions as the power of the statistical test changed. Students were also directed to HyperStat Online's interactive effect size calculator for interpreting the practical significance of group differences.

Overall, student responses to items written to assess "active learning" suggest that the majority of students perceived that the course assignments were engaging and motivating. Students overwhelmingly felt that the use of the SPSS software increased their interest in educational statistics (92%) and that the threaded discussions were designed to provoke thoughtful discourse among students and the instructor (79%). Ninety-seven percent of students indicated that the course was designed to allow them to take responsibility for their own learning. Student responses suggest that the course assignments and activities were engaging and supported the constructivist learning principle of self-directed learning. One student supported this conclusion by noting, "Learning on your own really seemed to solidify the concepts on a daily basis. Having to keep up with assignments made learning a smoother transition."

3.4. *Encourages prompt feedback*

Decades of research support the effectiveness of specific and timely feedback for enhancing task performance. Ammon's 1956 review of published research conducted nearly 50 years ago found that instructor feedback is more effective when delivered in close proximity to the time a task is performed (Kluger & DeNisi, 1996). The WebCT email and discussion tools supplied the dominant source of timely, individual feedback for students. The assignment tool was especially useful for supplying detailed evaluative and corrective feedback that students could use to revise and resubmit assignments. Another important use of email was to provide feedback regarding problems that students experienced using WebCT or submitting assignments. Initially, there were many occasions when students would submit an assignment that could not be opened with the word processing program used by the instructor. In efforts to avoid frustrated students and an even more frustrated instructor, a MS Word document was produced in a rich text file format that explained how to resave and submit original documents as rich

text files. Sending this document immediately to students after receiving an incompatible file increased task engagement and enhanced the efficiency of the WebCT learning environment. The WebCT “My Grades” tool was another source of feedback that provided students with current grade information for all completed assignments.

Responses to the four feedback items indicated that all students “agreed” that the instructor responded promptly to their questions about the use of WebCT, course assignments, and general course requirements. In addition, not only did students feel that feedback was timely but also felt that feedback was supportive (96%). The high percentage of students (88%) who indicated that the instructor motivated them to do their best was felt to be directly related to student perceptions of the instructor’s effort to supply prompt and supportive feedback. One student noted, “[The instructor] was very helpful, has a good teaching method and was good at giving positive as well as constructive feedback to us regarding assignments. He seemed to be more interested in making sure that we learned the material. . .” Another student remarked, “I was impressed with his prompt responses to my questions. I felt like he understood the difficulties I was having because I was new to WebCT and he was very patient and available for help. I appreciated that a lot.”

3.5. *Time on task*

The asynchronous nature of Internet-based learning environments allows students to participate in courses at anytime and any place, increasing the time available for completing tasks required to accomplish learning goals (Billings, 2000). EDCI 402 was not only accessible but was also structured to efficiently direct student efforts toward the completion of course assignments. The initial course log on directed students to a “Welcome Page” that housed course orientation, syllabus, schedule, calendar, assignment, and communication links. The assignment link took students to a page that contained pathways to the content modules and the assignment postings for SPSS activities. The WebCT content modules communicated instructional objectives for each topic, weekly reading assignments, and group problem-solving activities and contained links to examples of worked problems and interpretative reports. The assignment tool was advantageous for promoting time on task because students were automatically reminded about assignment due dates and new assignment postings each time they accessed the EDCI 402 course room. Students depended on these reminders and would contact the instructor immediately when assignments were created that failed to indicate a final date for submission.

Approximately 92% of students surveyed perceived that the course was well organized and facilitated effectively by the instructor. In addition, most students (83%) indicated that the course was organized in a manner that allowed them to complete assignments across a variety of learning environments (e.g., home, work, vacation). Student responses to this question suggest that Internet-based delivered courses similar to EDCI 402 provide students with additional time for engaging in learning activities and for completing course assignments. The advantage of taking educational statistics through WebCT was captured well by a student who remarked “I think offering this course on-line was extremely helpful for us students who are not on campus and can not be! I enjoyed being able to work on the problems in my own time and express my answers in written form.” Another student wrote, “I think most people learn better in a classroom setting, but this way forced me to learn, and so while I was frustrated in the beginning, I enjoy it now because I worked at my pace, and did homework when I had time, and didn’t have to sit through a three hour stats class. The instructor was very well planned out in his delivery of the course. Overall, I learned a lot, and would do it again.”

3.6. High expectations

The use of good examples is an effective practice for setting clear expectations for quality student performance. Examples that provide models of instructor expectations provide students with more precise guidelines about the type of work necessary for proficient assignment completion. The benefit of presenting examples that demonstrate solutions to authentic problems not only sets instructor expectations but also supports the development of cognitive schema that will help students evaluate future applications of their newly acquired knowledge and skills (Lim & Moore, 2002). EDCI 402 was designed to scaffold student learning with realistic examples, web-links, and simulations. The content modules housed links to examples of worked problems, representative SPSS outputs, model interpretative reports, APA style guides, and simulations designed to illustrate the applications of statistical concepts. Scoring rubrics designed to communicate instructor performance expectations for discussion postings, weekly problems, and SPSS reports were posted on the EDCI 402 assignment page.

Results from questions pertaining to “high expectations” suggest that most students felt that the models used to illustrate problem solutions clearly communicated expectations for weekly group problems (96%). All students indicated that the example interpretative reports provided guidance for completing individual SPSS activities. In addition, students generally felt that the instructor used good examples to explain statistical concepts (92%). The use of authentic examples with detailed explanations may be the primary reason that most students (96%) indicated that the course used instructional materials that were understandable and that the assignments were of appropriate difficulty level. One student noted, “There were no examinations but the SPSS assignments were challenging yet not too difficult to do well on. Work seemed about the right difficulty.” These results suggest that the use of good examples and models not only clearly communicated instructor expectations but also provided students with challenging assignments that could be successfully completed.

3.7. Diverse ways of learning

Learner-centered models of instruction advocate that prior knowledge, cognitive processing, personality styles, beliefs about learning, and demographics must be carefully considered when planning instruction (Svinicki, 1999). Creating an array of learning activities that allow multiple opportunities for demonstrating knowledge and skill proficiencies is one approach for planning instruction designed to address the diverse range of learning preferences and skills that learners bring to instructional environments. Weekly reading assignments, threaded discussions, and worked examples with detailed explanations were best suited for students with verbal processing strengths. Instructional activities incorporating rich graphics and visual imagery were a better match for learners with visual processing strengths. For example, the SPSS activities produced reports that presented results in the form of colorful charts and graphs. The interactive Java Applets designed to illustrate statistical concepts were effective learning tools because they used both words and pictures to integrate verbal and visual thinking providing instructional benefits to most students (Menges, 1994). Conducting statistical analyses with computers was not only beneficial for visual learners but also provided an instructional activity for students preferring a more hands-on approach to learning.

Student responses indicated that only 67% of students felt that the instructor adapted to students’ instructional needs. However, this result should be interpreted cautiously because 21% of students

indicated that they “did not know” if the instructor made adaptations. The students who indicated that the instructor made adaptations for instructional needs most likely requested and experienced those accommodations at sometime during the course. However, the majority of students (83%) felt that the instructor created instructional activities that allowed several different ways for students to demonstrate understanding of critical course concepts. Most learners (96%) perceived that the instructor was flexible regarding the completion of assignments. Every attempt was made to afford students reasonable amounts of flexibility when completing and submitting assignments. The Internet portals and computer equipment available to students studying from home often provide less accessibility than on-line instructors might expect. Online instructors, using the most current hardware connected to efficient campus-based networks must realize that accessibility issues affect certain students more adversely than others, causing difficulties when attempting to access courses. This limitation suggests that student–faculty communications cannot be limited to on-line course environments and that instructors must be available for telephone conversations and face-to-face meetings. Lack of access to courses can be a legitimate excuse for submitting late work and should be carefully considered when making grading decisions that penalize students.

4. Conclusions and recommendations

Results from student evaluations suggest that the majority of students felt that the instructor used the constructivist-based teaching practices recommended by the *Seven Principles* framework to effectively teach a master’s-level, Internet-based statistics course. Results from the survey questions designed to assess student’s overall course satisfaction reported in [Table 1](#) suggest that almost all students (92%) felt that the course was valuable and increased their understanding of educational statistics. One student remarked, “I feel I gained a lot from this course. I have been looking at many journal articles lately and find that I understand the figures where as before I just passed them over.” This comment helps to verify that the student learning that occurred was already being transferred and used with other academic coursework.

Although the majority of students expressed overall satisfaction with the course, areas for improvement were also identified. Several students expressed that it would have been helpful to hold an introductory meeting that would provide students with an opportunity to meet the instructor and receive introductory WebCT training. Several students expressed that optional classroom meetings scheduled periodically throughout the semester would have allowed them to obtain more detailed explanations of statistical concepts and their applications. One student suggested, “I would like to meet face-to-face at least a couple times a semester. That way, if I had any problems, the instructor could give me assistance and maybe even have me do some practice problems while he was present so I could be sure that I understood the concepts.”

The use of discussion and study groups was also identified as an area for improvement. For example, one student wrote, “The questions to ‘spark’ conversation were not open-ended and it was difficult to do more than answer the question.” Student concerns about the content of the discussion questions suggest that on-line teaching efforts should create discussions that stimulate conversations among students that demonstrate the understanding, application, and evaluation of statistical knowledge and skills. Discussion questions focused on comprehension, evaluation, and opinion are more likely to stimulate thoughtful discussions among students and promote deeper levels of understanding. Another issue

related to the discussion groups was the failure by some student to contribute equally to the completion of group assignments. The issue of nonparticipation can be addressed by requiring study groups members to post their contributions to assignments and vigilantly monitoring individual student contributions. Instructors must confront students who are not contributing to determine if this problem stems from an individual issue or an issue related to poor group dynamics. One technique for addressing nonfunctional groups may be to reassign students to study groups every few weeks. However, this practice may prevent groups from establishing the rapport necessary to collaborate productively on assignments. The problem of students failing to interact with group members is not unique to Internet-based courses and occurs even when group activities and projects are used as instructional activities with traditional, campus-based courses.

For many students, the Internet-based version of EDCI 402 was a first experience with a course delivered by WebCT. Only 33% (8) of the students enrolled in the course had already taken several courses delivered through WebCT. Most students with no previous on-line learning experiences were accustomed to direct instruction and found course expectations for EDCI 402 to be very different from previous experiences with traditional campus-based courses. The on-line version of EDCI 402 required learners to take responsibility and control over their own learning experiences facilitated by instructional activities and assignments designed by the instructor. Although students, in general, felt that the work was of appropriate difficulty level, there were several students who felt overwhelmed by the time commitment necessary to complete assignments. For example, one student remarked, “I found the work to be just about impossible. Long frustrating hours resulting in little learning” Another student stated, “It is way more work and real classroom setting would vastly improve understanding?” According to APA (1997), the acquisition of complex knowledge and skills, such as those taught in a graduate-level statistics course, demand considerable learner energy and effort. APA’s learner centered principles suggest that students must be willing to invest the time necessary for completing individual and group course assignments, and on-line instructors must be willing to develop authentic instructional materials that actively engage learners and motivate them toward expert performances.

The constructivist notion of learning suggests that both instructor and students have a stake in learning. When learners encounter difficulties, they must take the responsibility to mediate with the instructor to resolve situations that have interfered with the learning process. Instructors, on the other hand, must be available to provide supportive and corrective feedback in efforts to reduce learners’ frustrations. Students who prefer or require the flexibility of on-line instruction must be willing to invest the time it takes to complete the activities and assignments. On the other hand, course designers are obliged to inform learners of the self-directed nature of course requirements and the expectations for successful course completion. The WebCT syllabus tool and content modules are prime locations for instructors to communicate course objectives, assignments, assessments, and performance criteria.

Student responses and comments from the student evaluation of teaching questionnaire supports the conclusion that the constructivist-based teaching practices recommended by the Seven Principles of Good Practice were used to successfully promote learning and provide valuable learning experiences for students. The questionnaire developed for this study is an exploratory effort toward the creation of an instrument that can be used by students to supply instructors with feedback about the quality of their on-line teaching efforts. Organizations such as the American Association of Higher Education (AAHE) have made long-standing recommendations for the use of The Seven

Principles of Effective Teaching as a guide for the design and delivery of traditional higher education courses and programs. The on-line teaching evaluation instrument developed for this study supports those recommendations by supplying the type of feedback that is aligned to constructivist-based instructional practices that have been identified as essential for creating and delivering effective Internet-based courses.

Appendix A

Table 1
Frequency of student responses

Question	Percentage					
	SA	A	MA	MD	D	SD
<i>Student faculty contact</i>						
1. The instructor communicated effectively.	45.8	45.8	–	4.2	4.2	–
2. The instructor was enthusiastic about on-line teaching.	33.3	45.8	12.5	4.2	4.2	–
3. The instructor was concerned about student learning.	70.8	20.8	4.2	4.2	–	–
4. The instructor was generally respectful of student learning.	66.7	33.3	–	–	–	–
5. The instructor was accessible to me outside of the on-line course.	50.0	20.8	16.7	12.5	–	–
6. The instructor used WebCT to create a comfortable learning space.	20.8	58.3	12.5	4.2	–	4.2
7. The instructor personalized interactions with me whenever necessary.	79.2	12.5	4.2	4.2	–	–
<i>Cooperation among students</i>						
8. The instructor used WebCT to promote cooperative learning activities.	37.5	45.8	12.5	–	4.2	–
9. The instructor used WebCT to encourage students to interact with one another.	41.7	37.5	16.7	–	4.2	–
10. The course was structured so that I could discuss my assignments with other students.	16.7	50.0	25	4.2	4.2	–
<i>Active learning</i>						
11. The SPSS software increased my interest in educational statistics.	41.7	25.0	25.0	4.2	–	4.2
12. The instructor used WebCT to facilitate thoughtful discussions.	8.3	41.7	29.2	16.7	4.2	–
13. The course was designed to allow me to take responsibility for my own learning.	50.0	37.5	8.3	4.2	–	–
<i>Prompt feedback</i>						
14. The instructor responded promptly to my questions about the use of WebCT.	75	25	–	–	–	–
15. The instructor responded promptly to my questions about general course requirements.	75	25	–	–	–	–
16. The instructor responded promptly to my questions about course assignments.	87.5	12.5	–	–	–	–
17. The instructor motivated me to do my best.	37.5	41.7	8.3	8.3	–	4.2
<i>Time on task</i>						
18. The course was well organized.	29.2	50	12.5	8.3	–	–
19. The course was designed to allow assignments to be completed across different learning environments.	25	50	8.3	4.2	4.2	8.3
20. The instructor facilitated the course effectively.	41.7	41.7	8.2	4.2	4.2	–

(continued on next page)

Table 1 (continued)

Question	Percentage						
	SA	A	MA	MD	D	SD	
<i>Time on task</i>							
21. WebCT was used to create an efficient learning environment.	8.3	25	29.2	25	4.2	8.3	
22. WebCT helped me to learn educational statistics more quickly.	4.2	20.8	20.8	16.7	16.7	20.8	
<i>High expectations</i>							
23. The instructor provided models that clearly communicated expectations for weekly group assignments.	37.5	45.8	12.5	4.2	–	–	
24. The instructor provided models that clearly communicated expectations for SPSS assignments.	45.8	41.7	12.5	–	–	–	
25. The instructor used good examples to explain statistical concepts.	41.7	37.5	12.5	–	8.3	–	
26. The assignments for this course were of appropriate difficulty level.	16.7	66.7	8.2	–	4.2	4.2	
27. The instructor used WebCT design instructional materials that were understandable.	37.5	54.1	4.2	4.2	–	–	
Question	Percent						
	SA	A	MA	MD	D	SD	DK
<i>Diverse talents and ways of learning</i>							
28. The instructor adapted to students' instructional needs.	20.8	41.7	4.2	4.2	8.3	–	20.8
29. The instructor was tolerant of others' ideas and views.	12.5	33.3	8.4	–	–	–	45.8
30. The instructor designed the course so that technology would minimally interfere with learning.	8.3	50	25	12.5	4.2	–	–
31. The instructor was flexible regarding the completion of assignments.	66.6	29.2	4.2	–	–	–	–
32. The instructor provided several ways for students to demonstrate understanding of important course concepts.	12.5	50.0	20.8	12.5	–	4.2	–
<i>Overall</i>							
33. This course was valuable.	45.8	41.6	4.2	4.2	–	4.2	–
34. This course improved my understanding of educational statistics.	41.7	45.8	12.5	–	–	–	–
35. Taking this course increased my interest in educational statistics.	29.2	41.7	8.3	8.3	8.3	4.2	–

SA=strongly agree (6); A=agree (5); MA=mildly agree (4); MD=mildly disagree (3); D=disagree (2); SD=strongly disagree (1); DK=do not know.

M=mean; SD=standard deviation.

References

- Abrami, P. C., d' Appollonia, S., & Cohen, P. A. (1990). Validity of student ratings of instruction: What we know and what we do not. *Journal of Educational Psychology*, 82, 219–231.
- Aleamoni, L. M. (1978). Development and factorial validation of the Arizona Course/Instructor Evaluation Questionnaire. *Educational and Psychological Measurement*, 38, 1063–1067.
- Aleamoni, L. M. (1999). Student rating myths versus research facts from 1924 to 1998. *Journal of Personal Evaluation in Education*, 13(2), 153–166.
- American Psychological Association (1997, November). *Learner-centered psychological principles: A framework for school design and reform*. Retrieved March 12, 2004 from <http://www.apa.org/ed/lcp.html#Background>
- Astin, A. W. (1993). *What matters most in college: Four critical years revisited*. San Francisco: Jossey-Bass.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.

- Billings, D. M. (2000). A framework for assessing outcomes and practices in web-based courses in nursing. *Journal of Nursing Education, 39*(2), 60–67.
- Bonk, C. J., & Cunningham, D. J. (1998). Searching for learner-centered, constructivist, and sociocultural components of collaborative educational learning tools. In C. J. Bonk, & K. S. King (Eds.), *Electronic collaborators: Learner-centered technologies for literacy, apprenticeship, and discourse* (pp. 25–50). Mahwah, NJ: Erlbaum.
- Chickering, A. W., & Erhmann, S. C. (1996). Implementing the seven principles: Technology as lever. *AAHE Bulletin, 49*(2), 3–6.
- Chickering, A. W., & Gamson, Z. F. (1987, March). Seven principles for good practice in undergraduate education. *AAHE Bulletin, 39*(7), 3–7.
- Cooper, J., & Mueck, R. (1990). Student involvement in learning: Cooperative learning and college instruction. *Journal on Excellence in College Teaching, 1*, 68–76.
- Cross, P. K. (1999). What do we know about students' learning and how do we know it? *Innovative Higher Education, 23*(2), 255–270.
- Gallager, S., & Newman, A. (2002, September). *Distance learning at the tipping point: Critical success factors to growing fully online distance-learning programs*. Retrieved March 23, 2004, from http://www.eduventures.com/research/industry_research_resources/distancelearning.cfm
- Giguere, P., & Minotti, J. (2003). Developing high quality Internet-based training for adult learners. *Educational Technology, 4*, 57–58.
- Graham, C., Caglitay, K., Lim, B., Craner, J., & Duffy, T. M. (2001). *Seven principles for effective teaching: A practical lens for evaluating online courses*. The Technology Source. Retrieved February 19, 2004, from <http://ts.mivu.org/default.asp?show=article&id=839>
- Gravetter, F. J., & Wallnau, L. B. (2004). *Statistics for the behavioral sciences* (6th ed.). Belmont, CA: Wadsworth.
- Hacker, D. J., & Niederhauser, D. S. (2000). Promoting deep and durable learning in the online classroom. *New Directions for Teaching and Learning, 84*, 53–63.
- Johnson, D. W., Johnson, R. T., Smith, K. A. (1991). Cooperative learning: Increasing college faculty instructional productivity. ASHE-ERIC Higher Education Report No. 4. The George Washington University School of Education and Human Development, Washington, DC.
- Jonassen, D. H. (2000). *Computers as mindtools for schools*. Upper Saddle River, NJ: Merrill Prentice Hall.
- Jonassen, D. H. (2003). *Learning to solve problems with technology*. Upper Saddle River, NJ: Merrill Prentice Hall.
- Kirkpatrick, L. A., & Feeney, B. C. (2001). *A simple guide to SPSS for windows (for versions 8.0 & 9.0 & 10.0—revised edition)*. Belmont, CA: Wadsworth.
- Kluger, A. N., & DeNisi, A. (1996). The effects of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychological Bulletin, 119*, 254–284.
- Lane, D. (2004, March 13). *Effect size calculator*. In HyperStat online (measuring effect size). Retrieved March 15, 2004 from: <http://davidmlane.com/hyperstat/index.html>
- Lent, R. W., Brown, S. D., & Larkin, K. C. (1984). Relation of self-efficacy expectations to academic achievement and persistence. *Journal of Counseling Psychology, 31*, 356–362.
- Lim, E. L., & Moore, D. W. (2002). Problem-solving in geometry: Comparing the effects of non-specific instruction and conventional worked examples. *Educational Psychology: An International Journal of Experimental Educational Psychology, 22*(5), 591–612.
- Magnani, L., Nersessian, N. J., & Thagard, P. (1999). *Model-based reasoning in scientific discovery*. New York: Kluwer Academic/Plenum.
- Marsh, H. W. (1982). SEEQ: A reliable, valid, and useful instrument for collecting students' evaluations of university teaching. *British Journal of Educational Psychology, 52*, 77–95.
- Marsh, H. W. (1997). Making students' evaluations of teaching effectiveness effective: The critical issues of validity, bias, and utility. *American Psychologist, 52*(11), 1187–1197.
- Menges, R. J. (1994). Teaching in the age of electronic information. In W. J. McKeachie (Ed.), *McKeachie's teaching tips: Strategies, research, and theory, for college and university teachers* (9th ed.). Boston, MA: Houghton Mifflin.
- Millis, B. J., & Cottrell, P. G. (1998). *Cooperative learning for higher education faculty*. Phoenix, AZ: Oryx Press.
- Motiwalla, L., & Tello, S. (2000). Distance learning on the Internet: An exploratory study. *The Internet and Higher Education, 2*(4), 253–264.
- No Child Left Behind Act of 2001*, Pub.L.No. 107–110.

- Ogden, T. R. (2003). Applets for the Cybergnostics project Retrieved March 5, 2004 from Columbia University, Department of Biostatistics. Web site: <http://www.stat.sc.edu/~west/applets/power.html>
- Pahl, C. (2003). Managing evolution and change in Internet-based teaching and learning environments. *Computers and Education*, 40, 99–114.
- Pajares, F. (2002). Gender and perceived self-efficacy in self-regulated learning. *Theory Into Practice*, 41(2), 118–125.
- Partlow, K. M., & Gibbs, W. J. (2003). Indicators of constructivist principles in Internet-based courses. *Journal of Computing in Higher Education*, 14(2), 68–97.
- Pascarella, E. T., & Terenzini, P. T. (1991). *How college affects students*. San Francisco: Josey-Bass.
- Phipps, R. A., & Merisotis, J. P. (2000). *Quality on the line: Benchmarks for success in Internet-based distance education*. Washington, DC: The Institute for Higher Education Policy.
- Phipps, R. A., Wellman, J. V., & Merisotis, J. P. (1998). *Assuring quality in distance learning: A preliminary review*. Washington, DC: Council for Higher Education Accreditation.
- Pintrich, P. R., & DeGroot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, 82, 41–50.
- Reeves, T. C., & Reeves, P. M. (1997). Effective dimensions of interactive learning on the World Wide Web. In Bradual H. Kahn (Ed.), *Internet-based instruction* (pp. 59–66). Englewood Cliffs, NJ: Educational Technology Publications.
- Relan, A., & Gillani, B. B. (1997). Internet-based instruction and the traditional classroom: Similarities and differences. In Bradual H. Kahn (Ed.), *Internet-based instruction* (pp. 41–46). Englewood Cliffs, NJ: Educational Technology Publications.
- Schunk, D. (1983). Developing children's self-efficacy and skills: The roles of social comparative information and goal setting. *Contemporary Educational Psychology*, 8, 76–86.
- SPSS (2003). *SPSS 11.0 for windows student version*. Chicago, IL: Author.
- Svinicki, M. D. (1999). New directions in learning and motivation. *New Directions for Teaching and Learning*, 80, 5–27.
- Vye, N. J., Schwartz, D. L., Bransford, J. D., Barron, B. J., & Cognition and Technology Group at Vanderbilt. (1998). SMART environments that support monitoring, reflection, and revision. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Metacognition in educational theory and practice* (pp. 305–346). Hillsdale, NJ: Erlbaum.
- Young, S., & Shaw, D. A. (1999). Profiles of effective college and university teachers. *Journal of Higher Education*, 70(6), 670–686.