

## Effectiveness of Guided Design Learning Strategy on the Acquisition of Adult Problem-Solving Skills

Carol M. Trivette

The effects of implementing a guided design method of instruction on the acquisition of problem-solving skills, mastery of course content, and application of content to solve realistic situations constitute the primary foci of this practice-based research synthesis. Guided design is an instructional strategy that conveys subject matter while at the same time allowing students the opportunity to learn a decision-making process that focuses on realistic situations from the field of study. Findings from the 35 studies examined in this synthesis indicate that this method of instruction has a positive influence on the mastery of course content and content-based applications. Use of this strategy also positively impacts students' sense of personal competence and confidence as learners. Students are more satisfied with guided design instruction than with other instructional techniques. However, it appears that this instructional strategy does not impact noncontextualized critical-thinking skills. Implications for practice are described in terms of the types of instructional strategies that are most likely to improve both knowledge and realistic problem-solving skills in adult learners.

### Purpose

The primary purpose of this practice-based research synthesis is to determine the effects of a guided design instructional strategy on the (1) mastery of course content, (2) acquisition of problem-solving skills, and (3) successful application of course material to solve realistic problems. In this synthesis, the term *guided design* is used to describe an instructional method that includes a sequential process for solving problems, uses small group teaching technology, provides feedback on students' work, and focuses on realistic problems. This instructional strategy was first developed and widely used by Charles Wales (Wales & Stager, 1977, 1978; Wales & Hageman, 1979), who theorized that it was possible both to teach subject matter and develop decision-making skills students would need to solve problems they would face as professionals.

The conduct of the synthesis is guided by a framework that focuses on the degree to which variations in the guided design process are associated with variations in the knowledge and decision-making skills of students (Dunst, Trivette, & Cutspec, 2002). In general terms, a practice-based research synthesis differs from more traditional meta-analyses by systematically examining and unpacking the characteristics of practices that are related to differences in outcomes or consequences. Specifically,

this type of analysis focuses more on an understanding of *how* the same or similar characteristics exert the same or similar observable effects and not solely on statistical relationships between or among these variables.

### Background

With the admonishment, "Don't teach your students anthropology. Teach them to be anthropologists!" Charles Wales and Robert Stager put forth the philosophy of guided design (Wales & Stager, 1977). Wales and his colleagues believed this philosophy contained five basic principles of teaching: (1) guide the students' learning by providing them with a series of experiences that build on each other, (2) provide opportunities for students to apply and practice skills, (3) evaluate responses and provide feedback, (4) motivate or reinforce the learner, and (5)

*Bridges* is a publication of the Research and Training Center on Early Childhood Development, funded by the U. S. Department of Education, Office of Special Education Programs, Research to Practice Division (H324K010005). The opinions expressed in this paper are those of the Research and Training Center on Early Childhood Development, an organizational unit of the Center for Evidence-Based Practices at the Orelena Hawks Puckett Institute, and do not necessarily represent the views of the U. S. Department of Education. Copyright © 2005. The Puckett Institute. All rights reserved.

individualize to the learner's style. The goal of guided design is not to get the correct answer, but to know the process by which one gathers information, processes information, and arrives at an acceptable solution.

This approach brings both content knowledge and critical-thinking skills together and rests on several educational theories. These theoretical perspectives, including creative problem solving and simulation (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956; Dewey, 1933; Maslow, 1954), small group teaching (Miles, 1959), learning in a nonthreatening environment (Rogers, 1969), and role modeling (Bandura & Walters, 1963) are brought together in this instructional method. The guided design process, as developed by Wales and Stager, proposed the following 11 steps: (1) identify the problem; (2) state the basic objective or goal; (3) state the constraints, assumptions, and facts; (4) generate possible solutions; (5) choose the best solution; (6) analyze the meaningful parts of the solution; (7) synthesize elements to create solutions; (8) evaluate the solution; (9) report the results and make a recommendation; (10) implement the decision; and (11) check the results. Proponents of guided design argue that the theoretical model underlying this procedure is a realistic, but nonthreatening problem and decision-making approach where the context is relevant and actively processed by students.

Though developed by two university engineering professors, this instructional strategy has been used widely in various fields such as nursing (Selby & Tuttle, 1987), chemical and civil engineering (Baillie & Wales, 1975), pharmacy (Newton, Popovich, & Lehman, 1991), political science (Lawrence, 1980), and general education (Tillman & Pajak, 1986). It also has been used at various educational and training levels (e.g., high school, undergraduate, graduate, in-service). Though developed in 1969 and widely used between 1970 and 1990, guided design has features that are compatible with the more recent findings of the National Research Council.

The National Research Council (NRC) in 2000 compiled and reported on the research evidence examining how people learn most effectively. Though the language is different from that of the 1970s when Wales and Stager were developing and writing about guided design, many of the concepts they expounded are found in the research synthesis of the NRC. Specifically, the NRC's findings emphasize the following aspects as effective instructional strategies: (1) the importance of learning with understanding as opposed to the memorization of facts, (2) the need for students to be active participants in the learning process, and (3) the encouragement of learning communities. These findings are very consistent with Wales and Stager's (1977) belief in the importance of a group of learners devising solutions to realistic situations as the basis of learning.

### *Description of Guided Design Practice Characteristics*

As developers of this instructional strategy, Wales and Stager (1977) described 11 steps in the decision-making process. For this synthesis, the guided design process is conceptualized as containing four essential characteristics: (1) a sequential process for mastering course content, (2) a team or small-group processing component, (3) the provision of verbal or written feedback from a facilitator/teacher as a professional in the field concerning the solution reached or decision made, and (4) the use of realistic problems to be solved.

## **Search Strategy**

### *Search Terms*

The following search descriptors were used to locate relevant studies: guided design, learning strategies, participation decision making, problem solving, and teaching methods. In addition, author searches (e.g., Charles E. Wales and Robert A. Stager) were also explored.

### *Sources*

The primary databases searched for relevant studies were: Psychological Abstracts online (PsycINFO), Educational Resources Information Center (ERIC), Social Sciences Citation Index (SSCI), Sociological Abstracts and MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), InfoTrac Expanded Academic ASAP, ABI/INFORM Global, InfoTrac OneFile, Dissertation Abstracts Online, WorldCat, The Cochrane Library and Academic Search Elite. In addition, hand searches were completed for relevant journal articles, book chapters, and books in order to locate additional studies. The reference list of each newly identified study was reviewed to determine whether it contained studies previously unidentified.

### *Selection Criteria*

Studies were included in the synthesis if: (1) a guided design process was used as an instructional strategy in the study and (2) there was some type of student-level outcome measured.

*Exclusion criteria.* Since the characteristics of guided design in this practice-based synthesis focused on this educational strategy, studies that examined only alternative strategies were not included.

## **Synthesis Results**

Thirty-five studies were located in different research reports. Table 1 shows selected characteristics of study participants and the context in which guided design was used. Table 2 presents information regarding research designs used in the studies and characteristics of the guided design process found in each study.

### *Participants*

The studies included 3,495 students of whom 3,335 (95%) were in baccalaureate programs and 160 (5%) were in graduate programs (Table 1). Few studies reviewed in this synthesis provide any other information about the students participating in these studies. The majority (seven) of the 11 studies that report other information about the students indicates they were in nursing programs. In the seven studies that report gender of the students, on the average 77% of study participants were women. Ten studies, four of which were graduate level programs, provided information concerning the age of the students. These students were generally 22 years or older, which may not be representative of the students across the 31 studies.

The students were participating in classes in the following content areas beginning with the most frequent areas: nursing (10), engineering (8), science (4), business (4), education (2), foreign language (2), pharmacy (2), and one each of political science, psychology, and theater. Most of the studies (89%) were conducted in baccalaureate programs compared to graduate programs (11%). The course length ranged from five days to four years of college in these studies. The majority of the studies (51%) focused on courses taught for one semester.

### *Research Design*

Table 2 summarizes the research designs employed by each study. Fifteen studies (43%) used nonrandomized control groups, nine of these used a pretest/posttest design and six used only a posttest design. Eight studies (23%) used randomization when assigning students to control or experimental groups. Five (63%) of the random assignment studies used a posttest-only design and three (38%) used a pretest/posttest design.

### *Practices*

Considerable similarity was observed across studies regarding the four characteristics of guided design: (1) use of a sequential process of problem solving (SP), (2) a team or small-group component (TP), (3) the provision of verbal (V) or written (W) feedback (FB) by the instructor concerning the information used to obtain the solution reached or decision, and (4) use of realistic problems to be solved (RP). Of the 35 studies reviewed, the characteristics were defined in only 34 studies (see Table 2), since the characteristics in one study could not be disentangled (Tseng & Wales, 1972). Thirty-two studies used a sequential process, 32 studies used a group or team method in the decision-making process, 25 studies used written feedback, 18 studies used verbal feedback, and 34 studies used realistic situations for problem-solving activities.

### *Outcomes*

Table 3 provides information about the type of outcomes examined in the studies, summarizes the outcome

results, and presents whether reliability data on outcome measures was reported. A total of 76 outcome measures were examined across the 35 studies. Since most of the studies reviewed in this synthesis assessed the effectiveness of the guided design procedure in a number of outcome areas, these outcomes were organized by constructs. The five outcome constructs identified were (1) mastery of course content (CK), (2) student satisfaction with the guided design process (SGD), (3) general critical-thinking skills (CT), (4) student ability to apply the knowledge in realistic situations (AP), and (5) student perception of personal competence and confidence in the content area (PC). An assessment of course content knowledge was the outcome most often assessed (40%), followed by satisfaction with guided design (28%), personal competence and confidence in the content area (14%), student's ability to apply the knowledge in realistic situations (13%), and general critical-thinking skills (5%).

## **Synthesis Findings**

Tables 4 through 7 summarize the findings from the studies across the five outcome constructs. The tables contain both specific and summary information about the outcomes measured and the results found in each study.

### *Results*

*Course-related knowledge.* Table 4 shows the extent to which students' mastery of course content, measured in 26 studies, was related to the use of a guided design process. The type of measure used most often was an instructor-developed examination to determine how well students mastered the course material. There were a total of 30 assessments of knowledge about course content and 21 (70%) of these assessments reported that guided design produced positive effects on the mastery of course content, 8 assessments (27%) reported no difference between the guided design group and the control group, and 1 study found that the guided design group performed below the comparison group in mastery of course content. Of the eight assessments where no differences were found between groups, two findings were from the content areas of foreign language, general science, and nursing, and one finding was from engineering and pharmacy. In five of the eight assessments where no differences were found, the studies lasted less than 16 weeks (one semester).

*Satisfaction with guided design.* The level of student satisfaction with the guided design process is shown in Table 5. Satisfaction was assessed 21 times in 12 studies, and 17 assessments (81%) indicated that the students were more satisfied with the guided design process than a comparison instructional strategy. Four guided design satisfaction assessments were negative. Two negative assessments of the guided design process were found in a study in the area of foreign language where students

reported it neither helped their skills nor helped maintain their interest. Three of the four negative satisfaction assessments were found in courses that lasted less than a semester.

*Critical thinking.* One of the features of learning that guided design specifically was developed to improve was the critical thinking of students. Critical-thinking skills were examined in two ways in these studies. The first method was to assess noncontextual critical-thinking skills (CT), and the second way was to examine the critical-thinking process of students as they apply content knowledge to specific realistic situations (AP). Table 6 shows the results of these two assessments of critical thinking. The first four studies all used an assessment of general critical-thinking skills that was not related to the course content. None of these four studies reported an improvement in the critical-thinking skills as a result of using a guided design procedure.

The last seven studies examined students' critical-thinking skills by assessing the extent to which students could apply course content to realistic problem-solving situations. There were ten assessments of application of content in realistic situations in these studies, and six (60%) of the assessments indicated that application of content was more successful for students who experienced a guided design process. Four of the assessments of application of content to realistic situations indicated no difference between the groups.

*Personal confidence.* The students' perception of their personal competence and confidence in the content area was assessed in six studies (see Table 7). Nine of the eleven measures (82%) that examined personal confidence found that guided design, when used as an instructional strategy, has a positive impact on perceptions of students' abilities to make effective decisions and, in general, increases students' personal confidence in their abilities. The two measures that found no difference between the two groups were less direct measures (need for achievement and ambiguity to learning) of students' perception of personal confidence and competence.

#### *Rival Explanations*

Possible threats to internal validity (Campbell & Stanley, 1963; Cook & Campbell, 1979) and rival explanation (Yin, 2000) for the learning effects found in these studies are minimal or nonexistent for a number of reasons. Many of the possible rival explanations are ruled out by the similarity in findings across 15 studies with nonrandom subject assignment and eight studies with random subject assignment. The eight studies that used random assignment report positive findings in three outcome areas (content knowledge, satisfaction with guided design, application of knowledge). No random assignment studies were found for critical thinking or personal competence

outcomes. The studies where random assignment occurred dealt with concerns about selection, maturation, testing, instrumentation, history, statistical regression, mortality, and interactions with selection. Issues of maturation, testing, instrumentation, history, and statistical regression were also dealt with in the non-randomized studies. Though there is limited reliability data concerning whether the guided design procedure was implemented as planned, the large number of positive findings seen across studies suggests that it was the guided design procedure that produced the effects.

### **Conclusion**

Findings from this practice-based research synthesis indicate that when instruction includes: (1) sequential presentation of relevant knowledge, (2) problem-solving activities for learning teams to solve, (3) provision of feedback by the instructor during the process of developing solutions, and (4) use of realistic problems as the basis of much of the work, then there will likely be increases in the learner's (a) ability to retain instructional content, (b) critical application of content to realistic problems, and (c) confidence in their learning ability. Learners are also satisfied with this method of instruction.

It appears that this instructional strategy is effective across a variety of content areas, including business, nursing, engineering, and science. Though only two foreign language studies were included, the results suggest that this may be one area where guided design is not as effective. These findings also suggest that noncontextual critical-thinking skills are not strengthened by these types of instructional strategies and that feedback may be an important element in the critical application of content to realistic situations. There is also some indication that these instructional strategies may be more effective when used for a longer period of time, perhaps over several months.

The findings from this research synthesis are consistent with many of the recommendations of the National Research Council's report "How People Learn: Brain, Mind, Experience, and School," which is a synthesis of research on human learning (Bransford et al., 2000; Donovan, Bransford, & Pellegrino, 1999). Three of the important recommendations from this group are that real learning (1) moves beyond the memorization of facts, (2) encourages the learner to be actively involved in the learning process, and (3) occurs best when it occurs within a community of learners. These recommendations are clearly in line with the findings from this synthesis.

#### *Implications for Practice*

The findings from this research synthesis have three major implications for practice. First, when developing educational opportunities for adults, have learners in groups or teams allowing them to sequentially work through a process of gathering relevant information in order to solve a problem.

Second, the problem to be solved using this process should be based on realistic situations that the learner is likely to experience. Third, it is important to provide feedback that guides the learners through the problem-solving process, such as offering suggestions and perhaps direction, not as a teacher with the “correct” solution, but as a professional colleague.

The companion to the *Bridges* is a *Bottomlines* (Vol. 3, No. 1) report that describes the major findings from this practice-based research synthesis in nontechnical, user-friendly language. The *Bottomlines* summarizes what we know about guided design specifically for parents, practitioners, and trainers. To illustrate the practice, a vignette of what the training looks like when used is included. Both the *Bridges* and *Bottomlines* reports are being used to produce practice guides that take a user step-by-step through the process of developing and implementing a guided design instructional strategy. These guides will be available to readers in either electronic versions at our Web site ([www.researchgatoractucekubfi](http://www.researchgatoractucekubfi)) or written versions that can be obtained by writing us at our Research and Training Center address. Practice guides are developed by our staff when research evidence supports the use of a particular practice. For this synthesis, a written practice guide will be available.

### References

- Bailie, R. C., & Wales, C. E. (1975). PRIDE: A new approach to experiential learning. *Engineering Education, 65*, 398-402.
- Bandura, A., & Walters, R. H. (1963). *Social learning and personality development*. New York: Holt, Rinehart & Winston.
- Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *Taxonomy of educational objectives: The classification of educational goals: Handbook 1. Cognitive domain*. New York: David McKay.
- Bodine, B. (1978). Development of biochemistry activities and laboratory experiences for nursing students based on clinical cases and using the guided design approach. *Dissertation Abstracts International, 39*(08), B3804. (UMI No. 7902809).
- Bransford, J. D., Brown, A. L., Cocking, R. R., Donovan, M. S., Bransford, J. D., & Pellegrino, J. W. (Eds.). (2000). *How people learn: Brain, mind, experience, and school*. Washington, DC: National Academy Press.
- Bullard, B. D. (1986). Linear communications and signal processing: A guided-design approach. *Dissertation Abstracts International, 48*(03), A0634. (UMI No. 8713582).
- Campbell, C. M. (1984, April). *Guided design in foreign language education: Its potential as a viable model, method, and conversation strategy*. Paper presented at the Annual Meeting of the Central States Conference on the Teaching of Foreign Languages, Chicago, IL. (ERIC Document Reproduction Service No. ED255058).
- Campbell, C. M. (1986). The effects of guided design instruction on foreign language learning (Doctoral dissertation, Purdue University, 1986). *Dissertation Abstracts International, 47*(09), 3292A.
- Campbell, D. T., & Stanley, J. C. (1963). *Experimental and quasi-experimental designs for research*. Boston: Houghton-Mifflin.
- Cook, T. D., & Campbell, D. T. (1979). *Quasi-experimentation: Design and analysis issues for field settings*. Boston: Houghton Mifflin Company.
- Coscarelli, W. C., & White, G. P. (1982). Applying the ID process to the guided design teaching strategy. *Journal of Instructional Development, 5*(4), 2-6.
- Dewey, J. (1933). *How we think: A restatement of the relation of reflective thinking to the educative process*. New York: Heath.
- Donovan, M. S., Bransford, J. D., & Pellegrino, J. W. (Eds.). (1999). *How people learn: Bridging research and practice*. Washington, DC: National Academy Press.
- Dunst, C. J., Trivette, C. M., & Cutspec, P. A. (2002). An evidence-based approach to documenting the characteristics and consequences of early intervention practices. *Centerscope, 1*(2), 1-6. Available at: <http://www.evidencebasedpractices.org/centerscope/centerscopevol1no2.pdf>.
- Frazier, Z. M. (1981). The effects of the attribute of learning preference on two variations of guided design instruction with nursing students. (Doctoral dissertation, University of San Francisco, 1981). *Dissertation Abstracts International, 42*(12), A5036.
- Goldberg, F. M., & D'Amour, G. (1976). Integrating physics and the philosophy of science through guided design. *American Journal of Physics, 44*, 863-868.
- Goldberg, F. M., & Shuman, J. C. (1984a). Using guided design in a physical science course. *Journal of College Science Teaching, 13*, 350-355.
- Goldberg, F. M., & Shuman, J. C. (1984b). Using guided design to help students learn about the energy problem. *Journal of College Science Teaching, 14*, 122-127.
- Hancock, B. W., Coscarelli, W. C., & White, G. P. (1983). Critical thinking and content acquisition using a modified guided design process for large course sections. *Educational and Psychological Research, 3*, 139-149.
- Hancock, B. W., Jr. (1981). The effect of guided design on the critical thinking ability of college level ad-

- ministrative science students (Doctoral dissertation, Southern Illinois University, 1981). *Dissertation Abstracts International*, 42, 4275.
- Hepner, F. S. (1989). Effects of guided design with and without teacher support on the accuracy in formulating nursing care plans and clinical problem solving by student nurses. (Doctoral dissertation, University of Georgia, 1989). *Dissertation Abstracts International*, 50, 2336.
- Hoggard, P. E. (1980). A guided design approach to teaching general chemistry. *Journal of Chemical Education*, 57, 299.
- Landers, R. R. (1975). Evaluation of guided design in a technology course. *Dissertation Abstracts International*, 36(04), 2122A. (UMI No. 7521928).
- Lawrence, D. G. (1980). Guided design in the basic American government course. *Teaching Political Science*, 7, 321-328.
- Maslow, A. H. (1954). *Motivation and personality*. New York: Harper.
- Miles, M. B. (1959). *Learning to work in groups: A program guide for educational leaders*. New York: Teachers College Press.
- Miller, S. H. (1983). *Children as parents: Final report on a study of childbearing and child rearing among 12- to 15-year-olds*. New York: Child Welfare League of America.
- Newsome, G. G., & Tillman, M. H. (1990). Effects of guided design and lecture teaching strategies on knowledge recall and on problem-solving performance of student nurses. *Nursing Diagnosis*, 1(3), 89-96.
- Newton, G. D., Popovich, N. G., & Lehman, J. D. (1991). Development and evaluation of computer-assisted guided design for problem solving instruction in self-care pharmacy practice. *American Journal of Pharmaceutical Education*, 55, 301-310.
- Pawlak, S. M., Popovich, N. G., Blank, J. W., & Russell, J. D. (1989). Development and validation of guided design scenarios for problem-solving instruction. *American Journal of Pharmaceutical Education*, 53, 7-16.
- Redden, P. A., & Petriello, R. P. (1980). A guided design approach to developmental science. *Journal of Chemical Education*, 57, 712-715.
- Rogers, C. R. (1969). *Freedom to learn: A view of what education might become*. Columbus, OH: Merrill.
- Sears, J. T. (1973, March). *Measurement of affective behavior changes in students in an innovative engineering course: Final report*. Morgantown, WV: West Virginia University (ERIC Document Reproduction Service No. ED073948).
- Selby, M. L., & Tuttle, D. M. (1985). Teaching nursing research by guided design: A pilot study. *Journal of Nursing Education*, 24, 250-252.
- Selby, M. L., & Tuttle, D. M. (1987). Community health assessment and program planning in the nurse practitioner curriculum: Evaluation of a guided design learning module. *Public Health Nursing*, 4, 160-165.
- Selby, M. L., & Tuttle, D. M. (1988). Guided design: Evaluation of a model for teaching nursing research. *Journal of Nursing Education*, 27, 303-308.
- Sherren, D. C. (1972). Design and evaluation of an instructional unit in technical report writing. *Engineering Education*, 62, 814-815.
- Tillman, M. H., & Pajak, E. F. (1986). Teaching a classroom troubleshooting model via guided design. *Journal of Instructional Psychology*, 13, 63-70.
- Tseng, M. S., & Wales, C. E. (1972). Effect of a guided design course pattern on student personality variables. *Engineering Education*, 62, 812-813.
- Turner, S. L., & Bechtel, G. A. (1998). The effectiveness of guided design on ethical decision making and moral reasoning among community nursing students. *NursingConnections*, 11(1), 69-74.
- Wales, C. E. (1979). Does how you teach make a difference? *Engineering Education*, 69, 394-398.
- Wales, C. E., & Stager, R. A. (1977). *Guided design*. Morgantown: West Virginia University.
- Wales, C. E., & Stager, R. A. (1978). *The guided design approach*. Englewood Cliffs, NJ: Educational Technology Publications.
- Wales, S. K., & Hageman, V. (1979). Guided design systems approach in nursing education. *Journal of Nursing Education*, 18(3), 38-45.
- Wold, J. E. (1986). Group decision making: Teaching the process--An introductory guided design project. *Journal of Nursing Education*, 25, 388-389.
- Yin, R. K. (2000). Rival explanations as an alternative to reforms as "experiments". In L. Bickman (Ed.), *Validity and social experimentation: Donald Campbell's legacy* (pp. 239-266). Thousand Oaks, CA: Sage.

### Acknowledgements

Appreciation is extended to William C. Coscarelli, Ph.D., and Gregory Philip White, Ph.D., for their comments and suggestions on an earlier version of the paper. The opinions expressed in the paper, however, are solely those of the author and do not necessarily reflect those of the reviewers or the U.S. Department of Education.

### Author

Carol M. Trivette, Ph.D., is Co-Director and Research Scientist at the Orelena Hawks Puckett Institute, Morgantown, North Carolina (trivette@puckett.org).

Table 1  
*Characteristics of Study Participants*

Study	Sample Size	Subject Characteristics		Subject Area	Discipline	Program Type	Course Length
		Percent Female	Age				
Bailie & Wales (1975)	94	NA	NA	Chemical engineering	Chemical engineering	Baccalaureate	All college career
Bodine (1978)	137 (75-E, 62-C)	NA	NA	Biochemistry lab	Nursing	Baccalaureate	5 lab sessions
Borchardt & Lutkus (1980)	17	NA	NA	Theater history	Theater	Baccalaureate	Semester
Bullard (1986)	23 (12-E, 11-C)	NA	NA	Electrical engineering lab	Engineer	Baccalaureate	8 weeks
Campbell (1984)	36 (18-E, 18-C)	NA	NA	French	Foreign language	Baccalaureate	3 weeks
Campbell (1986)	130 (69-E, 61-C)	NA	NA	Spanish	Foreign language	Baccalaureate	Semester
Coscarelli & White (1982)	266 (180-E, 86-C) 283 (141-E, 142-C)	NA	NA	Production/Operation management	Business	Baccalaureate	Semester
Frazier (1981)	140 (65-Group GD, 75-Individual GD)	NA	NA	Psychology & physiological stress	Nursing	Baccalaureate	Semester
Goldberg & D'Amour (1976)	35	NA	NA	Natural science	General Education	Baccalaureate	Semester
Goldberg & Shuman (1984a)	150	NA	NA	Physical science	Non-science majors	Baccalaureate	2 semesters
Goldberg & Shuman (1984b)	98	NA	NA	Physical science	Non-science majors	Baccalaureate	3 weeks
Hancock (1981)	234 (110-E, 124-C)	NA	NA	Production management	Business	Baccalaureate	Semester
Hancock et al. (1983)	549 (321-E, 228-C)	NA	NA	Production management	Business	Baccalaureate	Semester
Hepner (1989)	62 (20-C, 21-GD with teacher support, 21-GD without teacher support)	95	31 <sup>a</sup>	Advanced nursing	Nursing	Baccalaureate	4 weeks
Hoggard (1980)	30	NA	NA	Chemistry	Chemistry	Baccalaureate	Semester
Hursh, VanArsdale, Medio, McAvoy & Wales (1980)	50 (26-E, 24-C)	10	NA	Engineering	Engineering	Baccalaureate	Semester
Landers (1975)	42 (15-C, 17-E <sup>1</sup> , 10-E <sup>2</sup> )	NA	NA	Process engineering	Engineering technology	Baccalaureate	Semester
Lawrence (1980)	134	NA	NA	American government	Political science	Baccalaureate	14 weeks
Miller et al. (1983)	80	NA	NA	General psychology	Psychology	Baccalaureate	NA
Newsome & Tillman (1990)	50	86	31 <sup>a</sup>	Fundamentals of nursing	Nursing	Baccalaureate	5 days

Table 1, continued

Study	Sample Size	Subject Characteristics		Subject Area	Discipline	Program Type	Course Length
		Percent Female	Age				
Newton et al. (1991)	20	65	22 <sup>a</sup>	Self care pharmacy practice	Pharmacy	Baccalaureate	Half semester
Pawlak et al. (1989)	30	NA	22 <sup>a</sup>	Self care pharmacy practice	Pharmacy	Baccalaureate	Semester
Redden & Petriello (1980)	60 (21-E, 39-C)	NA	NA	Methods of scientific investigation	Science	Baccalaureate	Semester
Sears (1973)	35 (16-E, 19-C)	NA	NA	Thermodynamics kinetics	Chemical engineering	Baccalaureate	2 semesters
Selby & Tuttle (1985)	25	96	32 <sup>a</sup>	Nursing research	Nursing	Graduate	11 weeks
Selby & Tuttle (1987)	19	95	33 <sup>a</sup>	Community health & assessment planning	Nursing	Graduate	14 hours
Selby & Tuttle (1988)	96 (25 from 1985 study)	90	29 <sup>b</sup>	Nursing research	Nursing	Graduate	Semester
Shaw (1980)	21 (21-E, NA-C)	NA	NA	NA	Business	Baccalaureate	Semester
Sherren (1972)	60	NA	NA	Engineering	Engineering	Baccalaureate	Semester
Snyder (1980)	53 (33-E, 20-C)	NA	18-45	Medical surgical	Nursing	Baccalaureate	Semester
Tillman & Pajak (1986)	45	NA	26 - 35	Instructional supervision	Elementary Education	Graduate	NA
Tseng & Wales (1972)	87 (65-E, 22-C)	NA	NA	Engineering design	Engineering	Baccalaureate	Semester
Turner & Bechtel (1998)	144	NA	26 <sup>b</sup>	NA	Nursing	Baccalaureate	NA
Wales (1979)	All West Virginia University engineering students	NA	NA	Two freshman engineering classes	Engineering	Baccalaureate	2 semesters
Wold (1986)	160	NA	NA	Nursing role	Nursing	Baccalaureate	Semester
Total 35 studies	3,495	77%			Nursing = 10 Engineering = 8 Science = 4 Business = 4 Education = 2 Foreign Lang. = 2 Pharmacy = 2 Political Sci. = 1 Psychology = 1 Theater = 1	Baccalaureate programs = 31 Graduate programs = 4	18 = 1 semester 3 = 2 semesters 10 = Less than 1 semester 1 = More than 2 semesters 3 = NA

<sup>a</sup>Mean age

<sup>b</sup>Median age

Table 2  
*Characteristics of Research Design and Guided Design Instructional Strategy*

Study	Research Design	Reliability <sup>b</sup>	Practice Characteristics <sup>a</sup>				
			SP	TP	FB		RP
					W	V	
Bailie & Wales (1975)	O <sub>1</sub> X O <sub>2</sub>	N	Y	Y	Y	Y	Y
Bodine (1978)	NR O <sub>1</sub> X O <sub>2</sub>	N	Y	N	Y	N	Y
	NR O <sub>1</sub> O <sub>2</sub>						
Borchardt & Lutkus (1980)	NR X O <sub>1</sub>	N	N	Y	Y	Y	Y
	NR O <sub>1</sub>						
Bullard (1986)	X O <sub>1</sub>	N	Y	Y	N	Y	Y
	O <sub>1</sub>						
Campbell (1984)	NR O <sub>1</sub> X O <sub>2</sub>	N	Y	Y	Y	Y	Y
	NR O <sub>1</sub> O <sub>2</sub>						
Campbell (1986)	NR O <sub>1</sub> X O <sub>2</sub>	N	Y	Y	Y	Y	Y
	NR O <sub>1</sub> O <sub>2</sub>						
Coscarelli & White (1982)	X O	N	Y	Y	Y	N	Y
Frazier (1981)	O <sub>1</sub> X O <sub>2</sub>	N	Y	Y	N	Y	Y
	O <sub>1</sub> O <sub>2</sub>						
Goldberg & D'Amour (1976)	X O	N	Y	Y	Y	N	Y
Goldberg & Shuman (1984a)	NR O <sub>1</sub> X O <sub>2</sub>	N	Y	Y	Y	N	Y
	NR O <sub>1</sub> O <sub>2</sub>						
Goldberg & Shuman (1984b)	NR X O <sub>1</sub>	N	Y	Y	Y	N	Y
	NR O <sub>1</sub>						
Hancock (1981)	NR O <sub>1</sub> X O <sub>2</sub>	N	Y	Y	Y	Y	Y
	NR O <sub>1</sub> O <sub>2</sub>						
Hancock et al. (1983)	NR X O <sub>1</sub>	N	Y	Y	Y	Y	Y
	NR O <sub>1</sub>						
Hepner (1989)	X O <sub>1</sub>	N	Y	Y	Y	Y	Y
	O <sub>1</sub>						
Hoggard (1980)	X O <sub>1</sub>	N	Y	Y	N	N	Y
	O <sub>1</sub>						
Hursh et al (1980)	O <sub>1</sub> X O <sub>2</sub>	N	Y	Y	Y	Y	Y
	O <sub>1</sub> O <sub>2</sub>						
Landers (1975)	NR O <sub>1</sub> X O <sub>2</sub>	N	Y	Y	Y	Y	Y
	NR O <sub>1</sub> O <sub>2</sub>						
Lawrence (1980)	X O	N	Y	Y	Y	Y	Y
Miller et al. (1983)	X O <sub>1</sub>	N	Y	Y	Y	Y	Y
	O <sub>1</sub>						
Newsome & Tillman (1990)	X O <sub>1</sub>	Y	Y	Y	Y	N	Y
	O <sub>1</sub>						

Table 2, continued

Study	Research Design	Reliability <sup>b</sup>	Practice Characteristics <sup>a</sup>				
			SP	TP	FB		RP
					W	V	
Newton et al. (1991)	NR O <sub>1</sub> X O <sub>2</sub> ----- NR O <sub>1</sub> O <sub>2</sub>	N	Y	N	N	N	Y
Pawlak et al. (1989)	O <sub>1</sub> X O <sub>2</sub> ----- O <sub>1</sub> O <sub>2</sub>	N	Y	Y	N	N	Y
Redden & Petriello (1980)	X O	N	Y	Y	Y	Y	Y
Sears (1975)	NR O <sub>1</sub> X O <sub>2</sub> ----- NR O <sub>1</sub> O <sub>2</sub>	N	Y	Y	N	Y	Y
Selby & Tuttle (1985)	O <sub>1</sub> X O <sub>2</sub>	N	Y	Y	Y	N	Y
Selby & Tuttle (1987)	O <sub>1</sub> X O <sub>2</sub>	N	Y	Y	Y	Y	Y
Selby & Tuttle (1988)	O <sub>1</sub> X O <sub>2</sub>	N	Y	Y	Y	Y	Y
Shaw (1980)	NR X O <sub>1</sub> ----- NR O <sub>1</sub>	N	Y	Y	*	Y	Y
Sherren (1972)	O <sub>1</sub> X O <sub>2</sub>	N	Y	Y	Y	N	Y
Snyder (1980)	NR X O <sub>1</sub> ----- NR O <sub>1</sub>	N	N	Y	N	N	Y
Tillman & Pajak (1986)	O <sub>1</sub> X O <sub>2</sub>	Y	Y	Y	Y	N	Y
Tseng & Wales (1972)	NR O <sub>1</sub> X O <sub>2</sub> ----- NR O <sub>1</sub> O <sub>2</sub>	N	*	*	*	*	*
Turner & Bechtel (1998)	NR O <sub>1</sub> X O <sub>2</sub> ----- NR O <sub>1</sub> O <sub>2</sub>	N	Y	Y	N	N	Y
Wales (1979)	O <sub>1</sub> X O <sub>2</sub>	N	Y	Y	Y	N	Y
Wold (1986)	X O	N	Y	Y	Y	N	Y
Total 35 studies	15 = Nonrandomized control group; 8 = Randomized control group; 7 = One-group pretest/posttest; 5 = One-group posttest only	2 = Y	32 = Y	32 = Y	25 = Y	18 = Y	34 = Y

<sup>a</sup>SP = Sequential process used, TP = Team processing, FB = Feedback given, W = Written feedback, V = Verbal feedback, RP = Realistic problems to solve

<sup>b</sup>Reliability collected on the implementation of the guided design process, Y = Yes, N = No

\*Information not provided

Table 3  
*Research Findings Across All Outcome Areas*

Study	Outcomes		Reliability <sup>b</sup>	Results
	Type <sup>a</sup>	Specific Measures		
Bailie & Wales (1975)	CK CK	• GPA at graduation • Job offers upon graduation	N	• GPA higher with less variability • Job offers - four offers compared to two at other universities
Bodine (1978)	CT SGD CK	• Watson-Glaser Critical Thinking Appraisal • Study attitudes toward college courses • Content knowledge	N	• Attitudinal increase for GD • No change in critical thinking • Final grade not different
Borchardt & Lutkus (1980)	SGD	• Attitudes toward instructional method	N	• Increase with satisfaction of GD class
Bullard (1986)	CK	• Content laboratory knowledge	Y	• Higher content scores with less variability were found for the experimental (GD) group in subject content
Campbell (1984)	CK SGD SGD	• Content knowledge • Attitudes toward GD - Skill development - Interest level	N	• No difference in language content • Higher % felt conventional strategy - Developed skills better - Maintained their interest
Campbell (1986)	CT CK CK	• Watson-Glaser Critical Thinking Appraisal -5th subtest • Writing and reading foreign language • Modern Language Cooperation Foreign Language Test (MLCAFLT) writing and reading	N	• No difference in WGCTA - 5th subtest • No difference on the MLACFLT-Reading • MLACFLT-Writing increased for GD group
Coscarelli & White (1982)	CK	• Content knowledge	N	• GD higher scores on content study • True in both studies
Frazier (1981)	CK SGD	• Content knowledge • Satisfaction with class	Y	• When taught in their preferred style, students did better • Satisfaction was higher when taught in preferred style
Goldberg & D'Amour (1976)	SGD SGD SGD SGD	• Attitudes to GD - Discussion - Type of experience - Decision making - Learn similarities	N	• 84% very pleased with: - Free to disagree and discuss - Challenging and meaningful experience - Improved decision making skills - Helped learn similarities in sciences, social sciences, and humanities
Goldberg & Shuman (1984a)	CK AP PC	• Content knowledge • Lab scores • Perceptions of decision making ability	N	• No difference in content • No difference in lab scores • GD greater perception of their decision making abilities
Goldberg & Shuman (1984b)	CK PC	• Content knowledge • Perceptions of leaving	N	• No difference in exam scores • GD perceived more about causes and partial solution & ability to discuss these issues
Hancock (1981)	CT CK	• Watson-Glaser Critical Thinking Appraisal • Content knowledge	Y	• No difference in critical-thinking skills • GD students had higher content scores
Hancock et al. (1983)	CT CK	• Critical thinking • Content knowledge	N	• No difference in decision making • Content acquisition GD better

Table 3, continued

Study	Outcomes		Reliability <sup>b</sup>	Results
	Type <sup>a</sup>	Specific Measures		
Hepner (1989)	CK AP AP	<ul style="list-style-type: none"> <li>• Content recall</li> <li>• Nursing plans</li> <li>• Application test</li> </ul>	N	<ul style="list-style-type: none"> <li>• GD not improve content recall</li> <li>• GD improve nursing care plans</li> <li>• GD with teacher support achieve higher levels of accuracy on application test</li> </ul>
Hoggard (1980)	SGD CK CK SGD	<ul style="list-style-type: none"> <li>• Dropout rate</li> <li>• Content exam</li> <li>• Pass rate</li> <li>• Attitude toward class</li> </ul>	N	<ul style="list-style-type: none"> <li>• 40% dropped out lecture class,</li> <li>• None dropped GD</li> <li>• Average on final exam lower for GD</li> <li>• Higher % of GD students passed</li> <li>• Higher % of GD students liked class</li> </ul>
Hursh et al. (1980)	CK SGD SGD	<ul style="list-style-type: none"> <li>• Course performance</li> <li>• Student attitudes towards course <ul style="list-style-type: none"> <li>- Type of experience</li> <li>- Logical thought process</li> </ul> </li> </ul>	Y	<ul style="list-style-type: none"> <li>• GD student increased knowledge 37% more than non-GD students</li> <li>• 100% GD rated course very good (80% non-GD)</li> <li>• 60% of GD felt logical independent thought required (43% non-GD)</li> </ul>
Landers (1975)	CK AP PC	<ul style="list-style-type: none"> <li>• Content knowledge</li> <li>• Application test</li> <li>• Semantic Differential (Affective Perceptions)</li> </ul>	N	<ul style="list-style-type: none"> <li>• No difference in content knowledge or application</li> <li>• GD did improve attitudinal change in E<sup>2</sup> group</li> </ul>
Lawrence (1980)	SGD SGD SGD	<ul style="list-style-type: none"> <li>• Students' perceptions of GD <ul style="list-style-type: none"> <li>- Approval of approach</li> <li>- Apply concepts</li> <li>- Problem solving</li> </ul> </li> </ul>	N	<ul style="list-style-type: none"> <li>• Range 38% to 79% strong or very strongly agree with GD approach</li> <li>• 79% GD help apply concepts in text</li> <li>• 75% perceived have abilities to solve problems</li> </ul>
Miller et al. (1983)	SGD SGD	<ul style="list-style-type: none"> <li>• Attitude to GD <ul style="list-style-type: none"> <li>- Attitude to GD</li> <li>- Use in other classes</li> </ul> </li> </ul>	N	<ul style="list-style-type: none"> <li>• More positive attitudes toward GD if told positive abilities</li> <li>• Did not think GD should be used in all classes</li> </ul>
Newsome & Tillman (1990)	CK AP	<ul style="list-style-type: none"> <li>• Content knowledge exam</li> <li>• Care plan created</li> </ul>	Y	<ul style="list-style-type: none"> <li>• No difference in content knowledge</li> <li>• GD group higher in creating care plans</li> </ul>
Newton et al. (1991)	CK SGD	<ul style="list-style-type: none"> <li>• Student achievement</li> <li>• Student attitudes to computer-assisted format</li> </ul>	N	<ul style="list-style-type: none"> <li>• Students regardless of format reached content goals</li> <li>• Students preferred print material to computer-assisted format</li> </ul>
Pawlak et al. (1989)	CK AP	<ul style="list-style-type: none"> <li>• Content exam <ul style="list-style-type: none"> <li>- Short answers</li> <li>- Multiple choice</li> </ul> </li> <li>• Problem solving project</li> </ul>	N	<ul style="list-style-type: none"> <li>• 100% of students scored 90% or above on content exam</li> <li>• 100% of students received "A" for problem solving project</li> </ul>
Redden & Petriello (1980)	SGD CK	<ul style="list-style-type: none"> <li>• Class dropout rates</li> <li>• Writing skills</li> </ul>	N	<ul style="list-style-type: none"> <li>• Lower GD dropout rate</li> <li>• Increase in writing skill</li> </ul>
Sears (1973)	PC PC PC	<ul style="list-style-type: none"> <li>• Achievement Anxiety Test</li> <li>• Rotter's External-Locus of Control</li> <li>• Professional attitudes</li> </ul>	N	<ul style="list-style-type: none"> <li>• GD decrease anxiety</li> <li>• GD increases in perception of importance of communication, greater understanding of engineer role</li> </ul>
Selby & Tuttle (1985)	CK	<ul style="list-style-type: none"> <li>• Knowledge of research process/skills</li> </ul>	N	<ul style="list-style-type: none"> <li>• Improvement in research knowledge</li> </ul>
Selby & Tuttle (1987)	AP PC	<ul style="list-style-type: none"> <li>• Ability to conduct community health assessment</li> <li>• Confidence in ability</li> </ul>	N	<ul style="list-style-type: none"> <li>• Increase in positive attitude about community health assessment</li> <li>• 95% more confident</li> <li>• 100% completed community health assessment at acceptable level</li> </ul>
Selby & Tuttle (1988)	CK AP	<ul style="list-style-type: none"> <li>• Knowledge of research process/skills</li> <li>• Ability to conduct research</li> </ul>	Y	<ul style="list-style-type: none"> <li>• Significant change in knowledge</li> <li>• Positive change in ability to conduct research</li> </ul>

Table 3, continued

Study	Outcomes		Reliability <sup>b</sup>	Results
	Type <sup>a</sup>	Specific Measures		
Shaw (1980)	CK	• Course GPA	N	• Increase from 3.0 to 3.3
Sherren (1972)	CK	• Content knowledge	N	• 70% did not have knowledge on pretest • 90% successfully completed objectives on post-test
Snyder (1980)	CK	• Course grades	N	Experimental group had 34% more “As”
Tillman & Pajak (1986)	CK	• Knowledge of stages of concern	Y	• GD helped learn troubleshooting model
Tseng & Wales (1972)	PC	• Rotter Internal - External LOC • Taylor’s Anxiety Scale • Achievement Scale of the Edwards Personal Preference Schedule • McDonald Revised Scale of Ambiguity Tolerance	N	• Experimental group - Increased internal LOC - Decreased manifested anxiety • No significant difference between groups on: - Need for achievement - Ambiguity tolerance
	PC			
	PC			
	PC			
Turner & Bechtel (1998)	AP	• Kelejian’s Judgment about Nursing Decisions - Moral reasoning - Ethical decision making	N	• No difference in moral reasoning • Only 1 out 7 factors ethical decisions related (taking professional initiatives advocacy role)
	AP			
Wales (1979)	CK	• Graduation rates • Graduation GPA	N	• 32% rise in graduation rates with no change in other schools • Graduation GPA 25% higher than control
	CK			
Wold (1986)	SGD	• Attitudes to GD experience	N	• 95% recommended to use again
Total 35 studies	CK = 30 SGD = 21 PC = 11 AP = 10 CT = 4		Y = 7 N = 28	

<sup>a</sup>CT = Critical thinking, CK = Content knowledge, SGD = Satisfaction with guided design, AP = Application to realistic situations, PC = Personal competence/confidence

<sup>b</sup>Reliability reported on the outcomes Y = Yes, N = No

Table 4  
*Research Findings Concerning the Mastery of Course-Related Knowledge*

Study	Outcomes		Results		Subject Area
	Type <sup>a</sup>	Specific Measures	Summary <sup>b</sup>	Specifics	
Bailie & Wales (1975)	CK CK	• GPA at graduation • Job offers upon graduation	+  +	• GPA higher with less variability • Job offers - four offers compared to two at other universities	Chemistry <sup>c</sup>
Bodine (1978)	CK	• Content knowledge	/	• Final grade not different	Nursing <sup>d</sup>
Bullard (1986)	CK	• Content laboratory knowledge	+	• Higher content scores with less variability were found for the experimental (GD) group in subject content	Engineering <sup>d</sup>
Campbell (1984)	CK	• Content knowledge	/	• No difference in language knowledge	Foreign language <sup>d</sup>
Campbell (1986)	CK CK	• Writing and reading foreign language • Modern Language Cooperation Foreign Language Test (MLCAFLT) writing and reading	/ +	• No difference on the MLACFLT-Reading • MLACFLT-Writing increased for GD group	Foreign language <sup>c</sup>
Coscarelli & White (1982)	CK	• Content knowledge	+	• GD higher scores on content study • True in both studies	Business <sup>c</sup>
Frazier (1981)	CK	• Content knowledge	+	• When taught in their preferred style, students did better	Nursing <sup>c</sup>
Goldberg & Shuman (1984a)	CK	• Content knowledge	/	• No difference in content	Science <sup>c</sup>
Goldberg & Shuman (1984b)	CK	• Content knowledge	/	• No difference in exam scores	Science <sup>d</sup>
Hancock (1981)	CK	• Content knowledge	+	• GD students had higher content scores	Business <sup>c</sup>
Hancock et al. (1983)	CK	• Content knowledge	+	• Content acquisition GD better	Business <sup>c</sup>
Hepner (1989)	CK	• Content recall	+	• GD not improve content recall	Nursing <sup>d</sup>
Hoggard (1980)	CK CK	• Content exam • Pass rate	- +	• Average on final exam lower for GD • Higher % of GD students passed	Science <sup>c</sup>
Hursh et al. (1980)	CK	• Course performance	+	• GD students increased knowledge 37% more than non-GD students	Engineering <sup>c</sup>
Landers (1975)	CK	• Content knowledge	/	• No difference in content knowledge	Engineering <sup>c</sup>
Newsome & Tillman (1990)	CK	• Content knowledge exam	/	• No difference in content knowledge	Nursing <sup>d</sup>
Newton et al. (1991)	CK	• Student achievement	/	• Students regardless of format reached content goals	Pharmacy <sup>d</sup>
Pawlak et al. (1989)	CK	• Content exam - Short answers - Multiple choice	+	• 100% of students scored 90% or above on content exam	Pharmacy <sup>d</sup>
Redden & Petriello (1980)	CK	• Writing skills	+	• Increase in writing skill	Science <sup>c</sup>

Table 4, continued

Study	Outcomes		Results		Subject Area
	Type <sup>a</sup>	Specific Measures	Summary <sup>b</sup>	Specifics	
Selby & Tuttle (1985)	CK	• Knowledge of research process/skills	+	• Improvement in research knowledge	Nursing <sup>d</sup>
Selby & Tuttle (1988)	CK	• Knowledge of research process/skills	+	• Significant change in knowledge	Nursing <sup>c</sup>
Shaw (1980)	CK	• Course GPA	+	• Increase from 3.0 to 3.3	Business <sup>c</sup>
Sherren (1972)	CK	• Content knowledge	+	• 70% did not have knowledge on pretest; 90% successfully completed objectives on posttest	Engineering <sup>c</sup>
Snyder (1980)	CK	• Course grades	+	• 34% of the GD students made "As"	Nursing <sup>c</sup>
Tillman & Pajak (1986)	CK	• Knowledge of stages of concern	+	• GD helped learn troubleshooting model	Elementary education
Wales (1979)	CK	• Graduation rates	+	• 32% rise in graduation rates with no change in other schools	Engineering <sup>c</sup>
	CK	• Graduation GPA	+	• Graduation GPA 25% higher than control	
Total 26 studies	30		+ = 21 / = 8 - = 1		8 = Less than one semester; 17 = One or more semesters

<sup>a</sup>CT = Critical thinking, CK = Content knowledge, SGD = Satisfaction with guided design, AP = Application to realistic situations, PC = Personal competence/confidence

<sup>b</sup>Summary of results: + = Positive outcome when using guided design, / = No difference in outcome when using guided design, - = Negative outcome when using guided design

<sup>c</sup>Course length was one or more semesters

<sup>d</sup>Course length was less than one semester

Table 5  
*Research Findings Concerning Students' Satisfaction with Guided Design Instruction*

Study	Outcomes		Results		Subject Norm
	Type <sup>a</sup>	Specific Measures	Summary <sup>b</sup>	Specifics	
Bodine (1978)	SGD	• Study attitudes toward college courses	+	• Attitudinal increase for GD	Nursing <sup>d</sup>
Borchardt & Lutkus (1980)	SGD	• Attitude toward instructor's strategy	+	• 95% and 75% overall evaluation very high	Theater <sup>c</sup>
Campbell (1984)	SGD SGD	• Attitudes toward GD - Skill development - Interest level	- -	• Higher % felt conventional strategy - Developed skills better - Maintained their interest	Foreign language <sup>d</sup>
Frazier (1981)	SGD	• Satisfaction with class	+	• Satisfaction was higher when taught in preferred style	Nursing <sup>c</sup>
Goldberg & D'Amour (1976)	SGD SGD SGD SGD	• Attitudes toward GD - Discussion - Type of experience - Decision making - Learn similarities	+ + + +	• 84% very pleased with: - Free to disagree and discuss - Challenging and meaningful experience - Improved decision making skills - Helped learn similarities in sciences, social sciences, and humanities	Science <sup>c</sup>
Hoggard (1980)	SGD SGD	• Dropout rate • Attitude toward class	+ +	• 40% dropped out lecture class, none dropped GD • Higher % of GD students liked class	Science <sup>c</sup>
Hursh et al. (1980)	SGD SGD	• Attitude toward course - Type of experience - Logical thought process	+ +	• 100% felt experience very good (80%) • 60% felt independent logical thought was required in GD group (43% non-GD)	Engineering <sup>c</sup>
Lawrence (1980)	SGD SGD SGD	• Students' perceptions of GD - Approval of approach - Apply concepts - Problem solving	- + +	• Range 38% to 79% strong or very strongly agree with GD approach • 79% GD help apply concepts in text • 75% perceived have abilities to solve problems	Political science <sup>d</sup>
Miller et al. (1983)	SGD SGD	• Attitude to GD - Attitude to GD - Use in other classes	+ -	• More positive attitudes toward GD if told positive abilities • Did not think GD should be in all classes	Psychology
Newton et al. (1991)	SGD	• Student attitudes to computer-assisted	+	• Students preferred print material to computer-assisted format	Pharmacy <sup>d</sup>
Redden & Petriello (1980)	SGD	• Class dropout rates	+	• Lower GD dropout rate	Science <sup>c</sup>
Wold (1986)	SGD	• Attitudes to GD experience	+	• 95% recommended to use again	Nursing <sup>c</sup>
Total 12 studies	21		+ = 17 - = 4		4 = Less than one semester; 7 = One or more semesters

<sup>a</sup>CT = Critical thinking, CK = Content knowledge, SGD = Satisfaction with guided design, AP = Application to real-life situations, PC = Personal competence/confidence

<sup>b</sup>Summary of results: + = Positive outcome when using guided design, / = No difference in outcome when using guided design, - = Negative outcome when using guided design

<sup>c</sup>Course length was one or more semesters

<sup>d</sup>Course length was less than one semester

Table 6  
*Research Findings Concerning the Mastery of Noncontextualized and Contextualized Critical-Thinking Skills*

Study	Outcomes		Results		Subject Area
	Type <sup>a</sup>	Specific Measures	Summary <sup>b</sup>	Specifics	
Bodine (1978)	CT	• Watson-Glaser Critical Thinking Appraisal	/	• No change in critical thinking	Nursing <sup>d</sup>
Campbell (1986)	CT	• Watson-Glaser Critical Thinking Appraisal - 5th subtest	/	• No difference in WGCTA - 5th subtest	Foreign language <sup>d</sup>
Hancock (1981)	CT	• Watson-Glaser Critical Thinking Appraisal	/	• No difference in critical-thinking skills	Business <sup>c</sup>
Hancock et al. (1983)	CT	• Critical thinking	/	• No difference in decision making	Business <sup>c</sup>
Goldberg & Shuman (1984a)	AP	• Lab scores	/	• No difference in lab scores	Science <sup>c</sup>
Hepner (1989)	AP AP	• Application test • Nursing plans	+ +	• GD with teacher support achieve higher levels of accuracy on application test • GD improve nursing care plans	Nursing <sup>d</sup>
Landers (1975)	AP	• Application test	/	• No difference in application	Engineering <sup>c</sup>
Newsome & Tillman (1990)	AP	• Care plan created	+	• GD group higher in creating care plans	Nursing <sup>d</sup>
Pawlak et al. (1989)	AP	• Problem solving project	+	• 100% of students received “A” for problem solving project	Pharmacy <sup>c</sup>
Selby & Tuttle (1987)	AP	• Ability to conduct community health assessment	+	• 100% completed content exam at acceptable level	Nursing <sup>d</sup>
Selby & Tuttle (1988)	AP	• Ability to conduct research	+	• Positive change in ability to conduct research	Nursing <sup>c</sup>
Turner & Bechtel (1998)	AP AP	• Kelefian’s judgment about nursing decisions - Ethical decision making - Moral reasoning	/ /	• No difference in model reasoning • Only 1 out of 7 factors were ethical decisions related (taking professional initiatives advocacy role)	Nursing
Total 12 studies	AP = 10 CT = 4		/ = 4 CT + = 6 AP / = 4 AP		5 = Less than one semester; 6 = One or more semesters

<sup>a</sup>CT = Critical thinking, CK = Content knowledge, SGD = Satisfaction with guided design, AP = Application to realistic situations, PC = Personal competence/confidence

<sup>b</sup>Summary of results: + = Positive outcome when using guided design, / = No difference in outcome when using guided design, - = Negative outcome when using guided design

<sup>c</sup>Course length was one or more semesters

<sup>d</sup>Course length was less than one semester

Table 7  
*Research Findings Concerning Students' Perceptions of Personal Confidence and Competence*

Study	Outcomes		Results		Subject Area
	Type <sup>a</sup>	Specific Measures	Summary <sup>b</sup>	Specifics	
Goldberg & Shuman (1984a)	PC	• Perceptions of decision making ability	+	• GD greater perception of their decision making abilities	Science <sup>c</sup>
Goldberg & Shuman (1984b)	PC	• Perceptions of leaving	+	• GD perceived more about causes and partial solution & ability to discuss these issues	Science <sup>d</sup>
Landers (1975)	PC	• Semantic Differential (Affective Perceptions)	+	• GD did improve attitudinal change in E <sup>2</sup> group	Engineering <sup>d</sup>
Sears (1973)	PC PC PC	• Professional Attitudes • Achievement Anxiety Test • Rotter's Locus of Control	+	• GD increases in perception of importance of communication, greater understanding of engineer role	Engineering <sup>d</sup>
			+	• GD decreases anxiety	
			+	• GD increases internal control	
Selby & Tuttle (1987)	PC	• Confidence in ability	+	• 95% more confident	Nursing <sup>c</sup>
Tseng & Wales (1972)	PC	• Rotter Internal - External LOC	+	• Experimental group - Increased internal LOC	Engineering
	PC	• McDonald Revised Scale of Ambiguity Tolerance	+	- Decreased manifested anxiety	
	PC	• Achievement Scale of the Edwards Personal Preference Schedule	/	• No significant difference between groups on: - Need for achievement	
	PC	• Taylor's Anxiety Scale	/	- Ambiguity tolerance	
Total 6 studies	11		+ = 9 / = 2		3 = Less than one semester; 2 = One or more semesters

<sup>a</sup>CT = Critical thinking, CK = Content knowledge, SGD = Satisfaction with guided design, AP = Application to realistic situations, PC = Personal competence/confidence

<sup>b</sup>Summary of results: + = Positive outcome when using guided design, / = No difference in outcome when using guided design, - = Negative outcome when using guided design

<sup>c</sup>Course length was one or more semesters

<sup>d</sup>Course length was less than one semester