

"Problem-based Learning: helping your students gain the most from PBL" 3rd edition, June 1996

Instructor's Guide for "Problem-based Learning: how to gain the most from PBL" ISBN 0-9698725-0-X

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7. Literature resources for PBL

Many have asked for a reading list of key articles and books. Howard Barrows created such a list and kindly gave me permission to use this as a starting resource. I have added my own recommendations.

7.1 BOOKS

Anderson, J.E., Ridley, T. (1977) "Cool School: An Alternative Secondary School Experience," Toronto, Ontario: Institute for Studies in Education.

**** Barrows, H.S. and R.M. Tamblyn (1980) "Problem-based learning: an approach to medical education", Springer Publishing Co., New York.

Barrows, H. (1994). Practice-Based Learning: Problem-Based Learning Applied to Medical Education, Springfield, IL: SIU School of Medicine.

Barrows, H. (1988). The Tutorial Process. Springfield, IL: SIU School of Medicine

This book is designed to help teachers wishing to develop tutorial or facilitator teaching skills in PBL.

Barrows, H. (1985). How to Design a Problem-based Curriculum for Pre-clinical Years. New York: Springer Publishing Co.

**** Boud, D. (1985) "Problem-based Learning in Education for the Professions," Higher Education Research and Development Society of Australasia, Kensington, NSW, Australia. an excellent overview with applications in law, social work, agriculture.

**** Boud, D., Feletti, G. (1991). The Challenge of Problem-based Learning. London: Kogan. A superb collection. However, some of the nitty-gritty details of what to do are missing.

Bouhuijs, P.A.J., H.G. Schmidt and H.J.M. van Berkel (1993) Problem-based Learning as an Educational Strategy," Network Publications, Maastricht, the Netherlands.

Bransford, John D. et al. (1990). *Anchored Instruction: Why We Need it and How Technology Can Help*. Cognition, Education, And Multimedia. Hillsdale, NJ: Erlbaum Associates.

Bridges, E., Hallenger, P. (1992). *Problem-based Learning for Educational Administrators*. Oregon: ERIC Clearinghouse on Educational Management.

Brown, G. and M. Pendleberry (1992) "Assessing Active Learning: parts 1 and 2" CVCP Universities' Staff Development and Training Unit, University House, Sheffield, S10 2TN, UK

Collins, A., Brown J.R., Newman S.E. (in press). *Cognitive Apprenticeship: Teaching the craft of reading, writing and mathematics*. In L.B. Resnick (Ed.), *Cognition and Instruction: Issues and Agendas* (1-35). Hillsdale, NJ: Lawrence Erlbaum Associates.

Collins, A., Stevens A.S. (1982). *Goals and Strategies of inquiry Teachers*. In R. Glasser (Ed.), *Advances in Instructional Psychology*. (pp 65-119). Hillsdale, NJ: Lawrence Erlbaum Associates.

Curry, L., J.F. Wergin (1993) "Educating Professionals: responding to new expectations for competence and accountability" Jossey-Bass Publishers, San Francisco, CA.

de Graaff, E. and P.A.J. Bouhuijs, DeVolder, M.L., Schmidt, H., GeFrave, W.S., Moust, J.H.C. (1984). *Motivation and achievement in cooperative learning: The role of prior knowledge*. In H. Heckhausen (Ed.). *Task Motivation and Achievement*. (335-347). Lisse, The Netherlands: Swets and Zeitlinger.

Duffy, T. (1994). *Strategic Teaching Framework: An Instructional Model for Learning Complex Interactive Skills*. *Instruction of Development State of the Art*, (3). Paradigms. C. Dells, A. Romeszowski (ed). Educational Technology Publications.

Johnson, M.L. *The Anatomy of Judgment*. (1943). London: Penguin Books.

Johnson, D.W. and F.P. Johnson (1982) "Joining Together," 2nd ed., Prentice Hall, Englewood Cliffs, NJ.

Johnson, D.W., R.T. Johnson and K.A. Smith (1991) "Active Learning: cooperation in the college classroom," Interaction Book Company, 7208 Cornelia Drive, Edina, MN 55435.

Katona, G. (1940). *Organizing and memorizing: Studies in the psychology of learning and teaching*. New York: Columbia University Press.

Keinmuntz, B. (1968). *The processing of clinical information by man and machine*.

(chp. 4). *The Formal Representation of Human Judgment*. Carnegie-Mellon University.

*** Knowles, M.S. (1975). *Self-directed Learning: A guide for learners and teachers*. New York: Association Press.

Tutor technique is very close to PBLI card. It explains to the learner what is expected of him and what are the teacher's responsibilities in a self-directed study course. The third section explains how both can find materials needed for their respective roles and how to effectively evaluate learning.

Mager, R.F. (1973). *Measuring instructional intent: Or, got a match?* Belmont CA: Fearon Publishers.

Mager, R.F. (1972) "Preparing Instructional Objectives," Fearon Publishers, Belmont, CA.

Medawar, P.B. (1969). *Introduction and intuition in scientific thought*. London: Methuen.

This is a collection of three lectures by Medawar discussing the inductive and intuitive thinking processes involved in the scientific method of thought.

Meiring, S.P. (1980) "Problem solving.. a basic mathematics goal: Part 1, becoming a better problem solver; part 2, A resource for problem solving," Dale Seymour Publications, PO Box 10888, Palo Alto, CA.

Nikerson, R. and Zoloth, P. (1988). *Technology in Education: Looking Toward 2020*. Hillsdale, NJ: Erlbaum Associates.

A panel of educators with expertise in a cross-section of disciplines and perspectives were asked to give their ideas as to how technology would change education by the year 2020. This is a collection of their individual, as well as, what all agreed should be goals for education through technology.

Novak, J.D. and D.B. Gowin (1984) "Learning How to Learn," Cambridge University Press, Cambridge MA. A classic with emphasis on concept maps and Gowin vee approaches.

Resnick, L.B. (1989) "Education and Learning to Think," National Academy Press, Washington, DC

Rowntree, D. (1977). *Assessing students: How shall we know them?* New York: Harper and Row Publishers.

Schmidt, W.H.O. (1965). *Process of Learning in Relation to Different Kinds of Material to be Learned*. Medial Education in South Africa. Reid, S.B.O. and Wilmot, A.J. Pietermaritzburg, So. Africa. Natal University Press.

*Schon, D.A. (1983). *The Reflective Practitioner: How professionals think in action*. New York: Basic Books, Inc.

Schon describes reflective thinking or problem-solving development in many situations and professions with special emphasis on medical and educational professions.

Sinnot, J. (1988). *Everyday Problem Solving*. New York: Praeger.

The author emphasizes the psychological side of problem-solving, why it works in the classroom as well as in every day "real" life. Also discusses necessary components of an ill-structured problem and arguments for changing education to follow a more problem-solving curriculum in the classroom.

7.2 NEWSLETTERS

***PROBE, the Australian Newsletter about PBL. To subscribe contact PROBLARC, CALT, University of Newcastle, University Drive, Callaghan, NSW 2308, Australia. <g.ryan@unsw.edu.au>

7.3 E-MAIL BULLETIN BOARDS

****PBLIST: started July 1993 at the University of Texas Health Science Center in San Antonio. Focuses on PBL in the health sciences.

Send the following one-line e-mail message to

<LISTPROC@sparky.uthscsa.edu>

SUBSCRIBE PBLIST Your-first-name Lastname

****PBL-LIST: the Australian centered list managed by Roger Hadgraft, Monash University. To subscribe send the following one-line e-mail message to

<MAJORDOMO@eng.monash.edu.au>

subscribe PBL-LIST

** Cooperative Learning. To subscribe send the following one-line e-mail message to

<LISTSERVER@jaring.my>

Subscribe CL Your-first-name Lastname

7.4 ARTICLES

AACP (1992) "Ability-based Outcome Goals for the Professional Curriculum," Report 1 from the AACP Focus Group on the Liberalization of the Professional Curriculum, AACP, Washington DC

Lists six outcomes and three levels of development for each: Critical thinking and decision-making abilities, Communication abilities, Responsible use of the values and ethical principles, Social awareness and social responsibility, Self-learning abilities and Habits and Social interaction and citizenship. Gives examples of the development of these abilities as part of the fabric of different courses in Pharmacy.

Albanese, M.A. and S.M. Mitchell (1993) "Problem-based Learning: a review of literature on its outcomes and implication issues," *Academic Medicine*, **68** 52-81.

Baron, J. (1981). Reflective thinking as a goal of education. *Intelligence*, 5, 291-309.

A discussion on reflective thinking and how and why it should be a goal in teaching. Using Dewey's definition of reflective thinking, Baron tries to describe the phases a person goes through in the thinking process to gain reflective thought.

Barrows, H.S. (1986). A Taxonomy of Problem-based Learning Methods. *Medical Teacher*, 20, 481-6.

This paper offers a classification for the many varieties of educational methods that are referred to as Problem-based. It supports the argument that each method addresses the possible educational objectives for PBL to differing degrees. Educators should be aware of this when choosing a particular technique. The method used by the PBLI is referred to as "Reiterative PBL."

Barrows, H.S., Myers, A.C. Williams, R.G., Moticka, E.J. (1986). Large group Problem-Based Learning: A possible solution for the "2" sigma problem. *Medical Teacher*, 8(4), 325-31.

Since many medical schools are concerned about the number of tutors required to work with small groups of students in PBL, this paper describes the design and application of PBL in a second year medical school class in immunology of seventy-two students involving the whole class and using only one, non-expert tutor.

Barrows, H., Tamblyn, R. (1976). An Evaluation of Problem-based learning in Small Groups Using a Simulated Patient. *Journal of Medical Education*, 51, 52-54.

The effectiveness of PBL in a first year neuroscience course was evaluated by comparing a subset of students given several PBL experiences using a standardized patient to students who volunteered for the PBL experience but were denied the ongoing neuroscience course. The surprising finding was the PBL group sought more direct experiences with actual neurological patients.

Benware, Carl. A., Dice, Edward. (1984). Quality of Learning With an Active Versus Passive Motivational Set. *American Education Research Journal*, 21 (4), 755-765.

This article centers around a study of student motivation. Students were given material to study at home in both control and experimental groups. The reason given to control group for material was testing; to the experimental group, to teach material to another student. At conclusion of two weeks, the students who were to teach had a better understanding of subject than the control group. The conclusion of researchers: if given the task of tutoring, students are motivated to gain a complete understanding of material given.

Berkson (1993) "Problem-based learning: have the expectations been met," *Academic Medicine*, **68**, S79-S88.

Birch, S. (1986). Towards a model for problem-based learning. *Studies in Higher Education*, 11 (1), 73-82/

Bloom, B.S. (1984). The 2 sigma problem: The search for methods of group instruction as effective as one-to-one tutoring. *Educational Researcher*, 13 (6), 4-16.

The article compares the strengths and weaknesses of conventional, mastery learning, and small-group tutor styles of teaching and the "2 sigma problem" in the assessment of student learning and retention at the end of the unit of study and longer-term retention. Several factors are considered besides teaching styles; such as home environment, outside influences, and the differences in the students themselves.

Blosser, Patricia E. (1988). Teaching Problem Solving-Secondary School Science. ERIC Clearinghouse for Science, Mathematics, and Environmental Education 2.

Blumenfeld, P.C. et al. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational Psychologist*, 26 (3,4), 369-398.

An argument for problem-based learning, but addresses the difficulties inherent in PBL such as; problem-structure, teacher and student motivation and sustaining interest with practical suggestions and also how technology can help.

Bransford, J.D. Stein, B.S., Shelton, T.S., Owings, R.A. (1981). Cognition and adaption: The importance of learning to learn. In J. Harvey (Ed.) *Cognition, Social behavior and the environment*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Bransford, J.D. (1993). Who ya Gonna Call? Thoughts About Teaching Problem Solving. Paper presented at the annual meeting of the American Educational Research Association.

Bridges, E., Hallinger, P. (1991). Problem-based Learning in Medical and Managerial Education. Paper presented at the Cognition and School Leadership Conference in Nashville, TN.

Brown, J.S., Collins, A., Dugvid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18 (1), 32-42.

Chamberlain, J. (1978) "Eliminating your SDBs: self defeating behaviours", Brigham Young University, Provo, UT.

Chamberlain, T.C. (1965). The method of multiple working hypotheses. (Reprinted from *Science*, 15:92, 1890). *Science* 148 (5), 754-9.

Chickering, A.W. and Z.F. Gamson (1987) "Seven Principles for good practice in undergraduate education," *AAHE Bulletin*, March, 3-7.

Cognition and Technology Group At Vanderbilt. (1990). Anchored Instruction and its Relationship to Situated Cognition. *Educational Researcher*; Aug-Sept. 2-10.

This article discusses effective situated cognition in conjunction with everyday problem-solving by use of a series of videotaped situations. Two sets have been developed at the writing of the article; one centers around math skills and the other around language arts in intermediate and jr. high classrooms.

Colby, K. (1986). Problem-based learning of social sciences and humanities. *Journal of Medical Education*, 61 (5), 413-415.

Collins, A. et al. (1991). Cognitive Apprenticeship: Making things visible. *American Educator*, 15 (3), 38-46.

Coreiro, P. (1990). Problem-based thematic instruction. *Language Arts*, 67 (1), 26-34.

Distlehorst, L.H., Barrows H.S., (1982). A new tool for problem-based self-directed learning. *Journal of Medical Education*, 57 (6). 486-8.

Dolmans, D.H. et al. (1992). Do Students Learn What Their Teachers Intend They Learn? Guiding Processes in Problem-based Learning. ERIC Document ED 343955.

Dolmans, D.H. et al. (1991). Course improvement based on course content data: An explorative study conducted in problem based curriculum. ERIC Document ED334220.

Report on reliable evaluative instrument for problem-based learning and how it was developed at the University of Limburg Medical School.

Dolmans, D.H.J.M., W.H. Gisealaers and H.C. Schmidt (1993) "Problem effectiveness in a course using problem-based learning," *Academic Medicine* **68**, 207-213.

Eisenstaedt, R. (1990). Problem-based learning: Cognitive retention and cohort traits of randomly selected participants and decliners. *Academic Medicine*, 65(9), 511-512.

A study based on the effectiveness of PBL versus the traditional study course at Temple University School of Medicine. The outcome of the two-year study revealed that PBL students tested lower on test scores at the end of study than the traditional students, but retained much more after retesting a year later.

ERIC/SMEAC. (1988). Teaching Problem Solving-Secondary School Science. ERIC Clearinghouse for Science, Mathematics, and Environmental Education 2.

Farmer, A. (1985). A new approach to physics teaching. *Physics Teacher*, 23 (6), 338-343.

Feltovich, P.J., (1982/1983). Expertise: Reorganizing and refining knowledge for use. *PREN*, 4 (3), 5-9.

Firestien, R., and Treffinger. (1989). Guidelines for Effective Facilitation of Creative Problem Solving. *Gifted Child Today*, 12 (5), 44-47.

Frederiksen, N. (1986). Toward a broader conception of human intelligence. *American Psychologist*, 41 (4), 445-52.

Frederiksen, N. (1984). Implications of cognitive theory for instruction in problem solving. *Review of Educational Research*, 54 (3), 363-407.

Gallagher, S., Rosenthal, H. and Stepien, W. (1992). The effects of problem-based learning on problem-solving. *Gifted Child Quarterly*, 36 (4), 195-200.

Geerlings, T. et al. (1993). Test Format and Test-directed Study Behavior in Problem-Based Learning. Paper presented at the annual meeting of the American Educational Research Association.

Gilhooly, K.J. (1990). Cognitive Psychology and Medical Diagnosis. *Applied Cognitive Psychology*, (4), 261-272.

Glaser, R. (1982). Education and thinking. EL Thorndike Address. American Psychology Association.

Godden, D.R., Baddeley, A.D. (1975). Context-Dependent memory in two natural environments: On land and underwater. *British Journal of Psychology*, 325-31.

Hael, J., Papert, S. (1990). Software Design as a Learning Environment. *Interactive Learning Environments*, (1). 1-32.

Hay, J.A. and Schmuck, M.F. (1993). Problem-based Learning: Development and Analysis of a Tutor Evaluation Form for use in Small-Group Problem-based Learning. Paper presented at the annual meeting of the American Educational Research Association.

Heliker, D. (1994) "Meeting the challenge of the curriculum revolution: problem-based learning in nursing education, *Journal of Nursing Education*, **33**, 1 45-47.

Hilgard, E.R., Irvine, R.P., Whipple, J.E. (1953). Rote memorization, understanding, and transfer: An extension of Katona's card trick experiments. *Journal of Experimental Psychology*, 46 (4), 288-92.

Keller, F.S. (1968). "Good-Bye teacher". *Journal of Applied Behavior Analysis*, 1 (1), 79-89.

Keller describes the curriculum style he and others developed. It encourages students to travel through "learning segments" in a certain course of study and proceeding to the next segment only after passing a mastery text-which may be taken as many times as needed. Includes a brief explanation of evolution and criteria for development of the program.

Kitchener, K. (1983). Cognition, Metacognition, and Epistemic cognition: A three Level Model of Cognitive processing. *Human Development*, 26 (4), 222-232.

Knoll, Jean W. (1993). An Introduction to Reiterative PBL. *Issues and Inquiry in College Learning and Teaching Spr/Smr*. 19-36.

An explanation of the development of the PBL process and the steps involved in tutoring a lesson. Based on Dr. Barrows' development of the PBL technique and how it follows the natural human problem-solving skills we all unconsciously use. Also, gives a basic explanation of the tutor/teacher role and structuring problems in the PBL technique.

Kurfiss, Joanne G. (1988). *Critical Thinking: Theory, Practice, Research and Possibilities*. ASHE-ERIC Higher Education Report #2.

Levine, H.G., Forman, P.B. (1973). A study of retention of knowledge of neuroscience information. *Journal of Medical Education*, 48 (9), 867-9.

Lewis, K.E. and R.M. Tamblyn (1987) "The Problem-based learning approach in baccalaureate nursing education: how effective is it?" *Nursing Papers*, **19**, 2, 17-26.

Magill, M.K. et al. (1988). A computer-assisted system for analysis of interaction in problem-based learning groups. *Evaluation and the Health Professions*, 11 (3), 318-332.

Margetson, D. (1991). Is there a future for problem-based education? *Higher Education Review*, 23 (2), 33-47.

Marton, F. and R. Saljo (1976) "On Qualitative Differences in Learning, outcome and process," *Bri. J. Educational Psychology*, **46**, 4-11.

McCloskey, M., Caramazza, A., Green, B. (1980). Curvilinear motion in the absences of external forces. Naive beliefs and the motion of objects. *Science*, 210 (4474), 1139-41.

McGaghe, Wm. C. (1991). Professional Competence Evaluation. *Educational Researcher*, 18 920, 5-11.

Messick, S. (1989). Meaning and Values in Test Valuation. *Educational Researcher*, 20 (1), 3-9.

Moss, G.D., McMillan, D. (1980). A strategy for developing problem-solving skills in large undergraduate classes. *Studies in Higher Education*, 980, 5 (2), 161-71.

Nash, P.P. et al. (1991). A student centered, Problem-based surgery clerkship. *Academic Medicine*, 66 (7), 415-17.

Needham, D. R., and I.M. Begg (1991) "Problem-oriented training promotes spontaneous analogical transfer: Memory-oriented training promotes memory for training," *Memory and Cognition*, Psychonomic Society, **19**, 6, 543-557.

Nisbett, R.E., Fong, G.T. Lehman, D.R., Cheng, P.W. (1987). "Teaching reasoning". *Science*, 238 (4827), 626-31.

Norris, S.P. (1989). Can We Test Validly for Critical Thinking. *Educational Researcher* 18, (9), 21-26.

Norman, G.R. (1988). Problem-solving skills, solving problems and problem-based learning. *Medical Education*, 22, 279-286.

Norman, G.R. and Henk Schmidt (1992) "The Psychological basis of problem-based learning: a review of the evidence," *Academic Medicine*, **67**, 557-565.

Norman, G.R. and Henk Schmidt (1993) "Where is the Learning in Problem-based Learning?" *Pedagogue*, **4**, 2 Summer. p. 1 and 4-6.

Palincsar, A.S., (1989). Less Charted waters. *Educational Researcher*, 8, 5-12.

Patel, V. et al. (1991) Effects of conventional and problem-based medical curricula on problem solving. *Academic Medicine*, 66 (7), 380-389.

Perfetto, G.A., Bransford, J.D., Franks, JJ. (1983). Constraints on access to a problem solving context. *Memory and Cognition*. 11(L), 24-31.

Perkins, D. et al. (1990) Teaching cognitive and metacognitive strategies. *Journal of Structural Learning*, 10 (4), 285-303.

Perkins, D.B., Salomon, G. (1989). Are cognitive skills context-bound? *Educational Researcher* 18 (1), 16-25.

Regan-Smith, Martha G., M.D., Ed.D. (1993). Student Learning through Rote Memorization in Traditional Compared to Problem-Based Schools: Is it Different? Paper presented at the 32rd annual RIME Conference of the Association of American Medical Colleges.

Regnier, D.P., Welsh, J.L., Quarton. (1994). The Problem-based Learning Curriculum At Southern Illinois University School of Medicine: A Student Perspective. *Annals of Community-Oriented Education*, 7, 259-266.

Second year medical students at Southern Ill. Un.School of Medicine discuss the strengths and weaknesses of their 2 year experience in a PBL curriculum with suggestions for improvement from a learner's point of view.

Romey, W. (1975). Transdisciplinary, problem-centered studies. *School Science and Mathematics*, 76 (1), 30-38.

Savery, J.R., Duffy, T. (1994). Problem-based Learning: An Instructional Model and It's Constructivist Framework. *Educational Technology*, Aug., 1-16.

An explanation of criteria for creating a problem and important steps and points to consider when writing and facilitating a successful problem. The Barrow's method and the PBL structure are central in this discussion of effective implantation of problem-based learning.

Schmidt, H.G. (1983) Problem-based learning: rationale and description. *Medical Education*, (17), 11-16.

The process of problem-based learning is described and measured against traditional learning principles.

Schmidt, H.G. (1984), Activatie van voorkennis en tekstverwerking (Activation of prior knowledge and text processing). *Nederlands Tijdschrift voor de Pshchologie*, 39, 335-47.

Schmidt, H.G. et al. (1993). Peer Versus Staff Tutoring in Problem-based Learning. Paper presented at the annual meeting of the American Educational Research Association.

Schmidt, H.G. Norman, G., and Boshuizen. (1990). A cognitive perspective on medical expertise. *Academic Medicine*, 65 (10), 611-621.

Schmidt, Henk G. (1983). Foundations of Problem-Based Learning: Some Explanatory Notes. *Medical Education*, 927), 422-432.

Schmidt, W.H.O. (1965). Process of learning in relation to different kinds of material to be learned. *Medical Education in South Africa*. Reid, J.B.O. and Wilmot, A.J. (Eds.). Peitermaritzburg, So. Africa: Natal University Press.

Schon, D.A. (1987) "Educating the Reflective Practitioner: toward a new design for teaching and learning in the professions", Jossey-Bass, San Francisco, CA.

Schwandt, T.A., Recapturing Moral Discourse in Evaluation. (1989). Educational Researcher, 18 (8), 11-16.

Shahabudin, S.H. (1987). Content coverage in problem-based learning, Medical Education, 21, 310-313.

Shoemaker, H.A. (1960). The functional context method of Instruction, Human resources research office IRE Transactions on Education, 3 (2), 52-7. Alexandria, VA: George Washington U.

The functional context method calls for breaking learning into small segments, starting with simple tasks to build upon. The study that is the subject of this article also found; 1) learning must have functional significance of the student; 2) must be relevant to goals of the instruction. This method was originally developed for Army fields radio repairmen with the assistance of the Human Resources Research Office and George Washington University.

Stepien, W., Gallagher, S., and Workman, D. (1993). Problem-based learning for traditional and Interdisciplinary classrooms. Journal for the Education of the Gifted, 16 (d4), 338-357.

Stepien, W., Gallagher, S., (1993). Problem-based learning: As authentic as it gets. Educational Leadership, 50 (7), 25-28.

Sternburg, R. (1982). Teaching scientific thinking to gifted children. Roeper Review, 4 (4), 4-6.

Stinson, J.E. (1990). Integrated Contextual Learning: Situated Learning in the Business Profession. ERIC Document ED319330.

Szekely, L. (1950). Productive processes in learning and thinking. Acta Psychological, 7, 388-407.

Tans, R.W., Schmidt, H.G., Schade-Hoogveen, BEJ., Gijsselaers, W.H. (1986). Sturing ven het onderwijsleerproces door middel van problem. Een fieldexperiment (Problem-based learning: A field experiment). Tijdschrift voor Onderwijsresearch, 11 (1), 35-46.

Townsend, J. (1990) "Problem-based Learning," Nursing Times, **86**, 14 61-62.

Vernon, D.T., and R.L. Blake (1993) "Does Problem-based Learning Work? A meta-analysis of evaluative research," Academic Medicine, **68**, 7, 550-563.

Wales, C.E. (1979). Does how you teach make a difference? *Engineering Education*, February, 394-398.

University of Western Virginia engineering department findings based on 6 years of open design curriculum for freshman students. Results emphasize better grades and better student understanding of subject matter.

Walton, H.J. and M.B. Matthews (1989) "Essentials of problem-based learning," *Medical Education*, **23**, 542-558.

Westcott, M.R., Ranzoni, J.H. (1963). Correlates of intuitive thinking. *Psychological Reports*, 12 (2), 595-613.

Wilkerson, L. (1993). Tutors, Strategies for Promoting Problem Solving in a Problem-based Tutorial. Paper presented at the annual American Education Research Association meeting.

Wilkerson, L., Feletti, G. (1989). Problem-based learning: One approach to increasing student participation. *New Directions for Teaching and Learning*, Spring (37), 51-60.

Wilkerson, LuAnn (1994) Identification of Skills for the Problem-based Tutor: Student and Faculty Perspectives", School of Medicine, University of California, Los Angeles, preprint.

Willems, J. (1981). Problem-based (group) teaching: A cognitive science approach to using available knowledge. *Instructional Science*, 10 (1), 5-21.

A discussion on levels of learning, the learning process and where PBL is most effective. It also introduces different types of problem structures and teacher roles. Very good for understanding the thinking process necessary to successfully carry off a problem-based experience as a student and as a tutor.

Williams, Susan M. (1992). Putting Case-Based Instruction Into Context: Examples From Legal and Medical Education. *The Journal of the Learning Sciences*, 2 (4), 367-427.

Woods, D. (1985). What about problem-based learning? *Journal of College Science Teaching*, 15 (1), 62-64.

Woods, D.R. (1984) "PS Corner," *Journal College Science Teaching*, **13**, May, 470-472. A description of the MPS **1**, "Awareness Workshop"

Woods, D.R. (1985) "Ideas for Action", PS Corner, *Journal of College Science Teaching*, **14**, May, 522-525. A description of the MPS **4**, "Strategy Workshop."

Woods, D.R., et al. (1985) "Fifty-six Challenges to Teaching Problem Solving", *Chem 13 News*, University of Waterloo, Waterloo, ON, p.155.

Woods, D.R. (1986) "Creativity and PS," PS Corner, Journal of College Science Teaching, **15**, Feb. 409-410. A very brief description of MPS 7, "Creativity Workshop."

Woods, D.R. (1989) "Developing Student's PS Skills," PS Corner, Journal of College Science Teaching, **19**, Nov., 109. A brief description of MPS 27. "Group skills Workshop."

Woods, D.R. (1991) "Handling the Large Class- ways to deal with a potentially bug problem," PS Corner, Journal of College Science Teaching, **20**, March/April, 298-300.

Woods, D.R. (1993) "Problem solving- what doesn't seem to work," PS Corner, Journal of College Science teaching, **23**, Sept/Oct, 57-58. and "'New Approaches for Developing PS Skills," PS Corner, Journal of College Science Teaching, **23**, Dec/Jan. 157-158.

Woods, D.R. (1993) "On the Learning in Problem-based Learning," Pedagogue, **4**, 2, Summer. p. 2-3.

Woods, D.R., W. Duncan-Hewitt, F. Hall, C. Eyles and A.N. Hrymak (1995) "Tutored and tutorless groups in PBL" McMaster University, Hamilton, ON

7.4 VIDEOTAPES

Barrows, H and H. MacRae (undated) "The Tutorial Process in PBL," Southern Illinois University School of Medicine, Office of Educational Affairs, PO Box 19230, Springfield IL 62794-9230

*** Daitz, B. (undated) "Learning medicine," The University of New Mexico School of Medicine, 2400 Tucker Dr., Albuquerque, NM 87131. Hour-long with much emphasis on the practical internship component. For PBL groups, I prefer to start with the helicopter and Jamie Opal as the simulated patient. This provides one of the better illustrations of small group, self-directed PBL in action.

de Grave, William and colleagues (1993) four videotapes (in English) "Problem-based learning in the tutorial group," (35 min, ISBN 90-5398-021-0) Shows a tutorial group working through the PBL process.

"Opinions about PBL in the tutorial group," (11 min, ISBN 90-5398-020-2) Students give their reactions to PBL;

"Critical incidents for the tutor," (1994; 27 min, ISBN 90-5398-031-8) Shows 20 critical situations and ways of handling them.

"The tasks of the tutor in the report phase," (19 min, ISBN 90-5398-028-8)

Department of Educational Research and Development, Medical School, University of Limburg, Box 616, 6200 MD Maastricht, the Netherlands.

Jason, Hill and J. Westerberg (1988) seven videotapes on "Clinical Teaching:" "Orienting learners," "Assessing learner's needs," "Developing plans for learning," "Developing systematic practice," "Asking questions," "Fostering learner's self-critique" and "Providing constructive feedback." Centre Communications, 1800 30th Street, #207, Boulder CO 80301 (303-444-1166)

Cleave-Hogg, D., E. Flak, L. Russell and J. Meharchand (1994), "The Tasks of the Tutor," (15 min) Introduces how to get started with your first group. Used primarily for tutors.

"Common Problems" (20 min) Introduces 5 to 6 common problems through a vignette and offers different types of solutions. Used for students and tutors to stimulate discussion. Faculty of Medicine, University of Toronto, Toronto, M5S 1A8

* Suzuki, D. (undated) "Doctors of Tomorrow," from the CBC program "The Nature of Things," available from the Filmmaker's Library, 124 East 40th St., New York, NY 10016. 30 min., difficult to see the small group, self-directed PBL in action.

* Tough, Allen, G. Griffin, Bill Barnard and Don Brundage (undated, ca 1980) "The Design of Self-directed Learning," Dept. of Adult Education, Ontario Institute for Studies in Education (OISE), Toronto, ON. Three videotapes plus a manual. The tapes show Griffin discussing, with two former students, the transitions the students had to make in adapting to this SDL approach; Griffin and the students exploring the components that Griffin includes in the design of SDL (creating a supportive learning climate, importance of students **reflecting** on their learning experiences, the importance of learning partners and the "closure activities of the group critique" that she uses for each session and for the course). In the third tape, Tough questions learning contracts and Barnard and a student evolve a learning contract. Later in the same tape, Tough and his students discuss his approach.

** Wales, C.E. (1974) "Guided Design," University of West Virginia, Morgantown, WV. Excellent illustration of tutorless groups and how to use PBL in large classes. Tends to take a global view so that we cannot hear much discussion within the groups. Useful for educators but less appropriate to show to students because of the dated appearance, style and clothing of participants.

WGBH Boston NOVA program "Can we make a better doctor" describes the New Pathways program at Harvard.

Woods, D.R. (1994) "The MPS SDL program," Department of Chemical Engineering, McMaster University, Hamilton, ON (24 min) Woods introduces ideas of subject-based versus problem-based, outlines the context of 1 instructor with 5 to 8 tutorless groups. See students preparing agenda, running the Goals, Teach and Feedback meetings. Closes with Woods interviewing a student about her journal on "Being a Chairperson." The latter is mostly talking with little detail.

[Another tape called "Student Response to SDL" interviews the students seen in the videotape "The MPS SDL program." Nothing startling is revealed other than the student's strong preference for this approach. Of limited value to either educators or students.]

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