## 問題導向學習對國中生學習態度與問題解決能力之影響 - 以幾何圖形為例 藍彥文、謝智玲

E-mail: 365037@mail.dyu.edu.tw

## 摘要

本研究的目的在於探討該課程對於學習態度與問題解決能力之影響。本研究以南投縣梅花(化名)國中兩班八年級學生為研究對象,一班為實驗組,於100學年度下學期以PBL融入每週5節、每節45分鐘的數學領域課程中,進行為期二個月的問題導向學習融入數學科教學,對照組則維持傳統的講述式教學法,兩班學生皆為31位。採用準實驗設計之不等的前測-後測-延宕控制組設計,使用的研究工具為「數學學習態度量表」和「問題解決能力量表」,資料分析採用「單因子多變量共變數」及「單因子共變數」進行統計檢定,並輔以「課程總回饋表」進行研究結果討論。 依資料分析結果,本研究獲致以下結論:一、接受「問題導向學習」的學生在整體的學習態度,和「興趣」、「重要性」及「教師」分量表的表現顯著優於對照組。但在「職業」分量表的表現,兩組學生無顯著差異。二、接受「問題導向學習」的學生在「重要性」及「教師」分量表的表現具有保留效果。三、接受「問題導向學習」的學生在「問題解決能力」的表現顯著優於對照組,並具有保留效果。四、學生對於「問題導向學習」給予正面肯定。

關鍵詞:問題導向學習、學習態度、問題解決能力

## 目錄

中文摘要 iii 英文摘要 iv 誌謝辭 v 內容目錄 vi 表目錄 viii 圖目錄 x 第一章 緒論 1 第一節 研究動機 1 第二節 研究目的 2 第三節 研究問題 3 第四節 名詞釋義 4 第五節 研究範圍與限制 5 第二章 文獻探討 7 第一節 問題導向學習 7 第二節 學習態度 19 第三節 問題解決能力 25 第三章 研究方法 31 第一節 研究設計與架構 31 第二節 實驗課程的實施 34 第三節 研究對象 35 第四節 研究工具 36 第五節 實驗教學方案及實施程序 45 第六節 資料處理分析 48 第四章 研究結果與討論 50 第一節 問題 導向學習對學習態度的影響 50 第二節 問題導向學習對問題解決能力的影響 62 第三節 問題導向學習的活動回饋 66 第四節 綜合討論 68 第五章 結論與建議 76 第一節 結論 76 第二節 建議 77 參考文獻 81 附錄A 學習態度量表預試問卷 95 附錄B 問題解決能力量表預試問卷 96 附錄C 課程活動總回饋表 97 附錄D 問題導向學習融入數學教學教案 98 附錄E 單元學習單 106

## 參考文獻

一、中文部分 王美芬、熊召弟(2005)。國小階段自然與生活科技教材教法。臺北市:心理。 王聖文(2010)。國小高年級學童以電腦 軟體進行繪畫與設計之學習態度研究(未出版之碩士論文)。國立臺中教育大學,臺中市。 沈志龍(2009)。數學史融入因數與倍數 教學對國小六年級學童數學學習態度之影響(未出版之碩士論文)。臺北市立教育大學,臺北市。 吳秋帆(2006)。國小音樂才能班 學生學習態度與音樂學習成就相關性之研究(未出版之碩士論文)。國立臺南大學,臺南市。 吳明隆(2007)。SPSS統計應用學習實 務:問卷分析與統計。台北:知城。 李秀華 ( 2005 ) 。國小書法欣賞教學對學生書法學習態度的影響。師大學報 , 50 ( 2 ) , 69-88。 李德 治、童惠零(2009)。多變量分析。臺北市:雙葉書廊。 林生傳(2005)。教育社會學。臺北市:巨流圖書公司。 林惠敏(2010)。問題 導向學習(PBL)在大學通識課程操作之檢視 - 以《家庭與人際關係:經典劇本導讀》為例(未出版之碩士論文)。國立中山大學,高雄市 。 洪基?(2011)。臺中市國民小學國樂團學生國樂學習態度、學習環境、學業學習成就對國樂學習成就影響之研究(未出版之碩士論 文)。中臺科技大學,臺中市。秦夢群(1992)。高中教師管理心態、學生內外控與學生學習習慣與態度之關係研究。教育與心理研 究, 15, 129-172。 教育部(1998)。國民教育九年一貫新課程介紹。公教資訊, 2(4), 1-5。 張玉成(1993)。思考技巧與教學。臺北 市:心理。 張春興(1991)。現代心理學。臺北市:東華。 張春興(2000)。教育心理學—三化取向的理論與實踐。臺北市:東華。 詹秀 美、吳武典(1991)。問題解決測驗指導手冊。臺北市:心理。 郭生玉(1985)。心理教育測驗。臺北市:精華。 郭明田(2011)。以合 作式數學寫作提升高職學生數學學習態度與數學學習成就之行動研究(未出版之碩士論文)。國立彰化師範大學,彰化市。 陳靜瑜 (2009)。利用網路PBL系統進行生態池教學對國小六年級學生科學過程技能及問題解決能力之影響(未出版之碩士論文)。臺北市立 教育大學,臺北市。 黃仁賢(2011)。臺北市國小高年級學生游泳能力與學習態度相關研究(未出版之碩士論文)。國立臺灣師範大 學,臺北市。 黃茂在、陳文典(2004)。「問題解決」的能力。科學教育月刊,273,21-41。 黃珮瑛(2007)。國小學生對學校與民 間視覺藝術課程學習態度之研究--以台中縣清水鎮為例(未出版之碩士論文)。國立新竹教育大學,新竹市。葉乃慈(2010)。影響國 小學童自然與生活科技問題解決能力(未出版之碩士論文)。國立嘉義大學,嘉義市。 錢宗忻(2004)。澎湖縣外籍配偶子女學習態 度現況調查研究(未出版之碩士論文)。國立臺南大學,臺南市。 蔡文標(2002)。影響國小數學低成就學生數學成就的相關因素及 直接教學效果之研究(未出版之碩士論文)。國立彰化師範大學,彰化市。 魏麗敏(1988)。國小學生數學焦慮、數學態度與數學成 就之關係暨數學學習團體諮商之效果研究(未出版之碩士論文)。國立臺灣師範大學,臺北市。 鄭麗玉(1993)。認知心理學—理論

與應用。臺北市:五南。 二、英文部分 Ahern, A. A. (2010). A case study: Problem-based learning for civil engineering students in transportation courses. European Journal of Engineering Education, 35(1), 109-116. Aiken, L. R. (1974). Attitudes toward mathematics. Review of Educational Research, 40(4), 551-596. Akc,ay, B. (2009). Problem-based learning in science education. Journal of Turkish Science Education (TUSED), 6(1), 26-36. Albanese, M. A., & Mitchell, S. (1993). Problem-based learning: A review of literature on its outcomes and implementation issues. Academic Medicine, 68(1), 52-81. Aspegren, K., Blomqvist, P., & Borgstrom, A. (1998). Live patients and problem-based learning. Medical Teacher, 20(5), 417-420. Aspy, D. N., Aspy, C. B., & Quimby, P. M. (1993). What doctors can teach teachers about problem-based learning. Educational Leadership, 50 (7), 22-24. Bandura, A. (1997). Self-Efficacy: The exercise of control. New York, NY:Freeman, Barron, B. J. S. (2002). Achieving coordination in collaborative problem-solving groups. J. Learn. Sci., 9, 403-437. Barrows, H. S., & Tamblyn, R.M. (1980). Problem-based learning: An approach to medical education. New York, NY: Springer. Barrows, H. S., & Kelson, A. M. (1993). Problem-based learning: A total approach to education. Urbana, IL: Illinois University Press. Barrows, H. (1994). Practice-based learning: Problem-based learning applied to medical education. Springfield: Southern Illinois University Press. Barrows, H., & Kelson, A. C. (1995). Problem-based learning in secondary education and the problem-based learning institute (Monograph 1), Problem-based learning institute, Springfield, IL. Barrows, H. S. (1998). The essentials of problem-based learning. Journal of Dental Education, 62(9), 630-633. Barrows, H. S. (2000). Problem-based learning applied to medical education, Southern Illinois University Press, Springfield, Bartels, B. H. (1998). Integrating the disciplines in the elementary grades with problembased learning. The Delta Kappa Gamma Bulletin, 64(3), 9-14. Bligh, D. A. (2000). What 's the use of lectures? San Francisco: Jossey-Bass Publishers. Brodie, L. M., & Porter, M. (2008). Engaging distance and on-campus students in problem-based learning. European Journal of Engineering Education, 33 (4), 433-443. Cavanagh, S. (2005). Educators revisit girls 'loss of math, science interest some suggest employing varied teaching strategies to motivate students. Education Week, 24, 6. Chi, M. T. H., Feltovich, P., & Glaser, R. (1981). Categorization and representation of physics problems by experts and novices. Cogn. Sci., 5, 121-152. Chin, C., & Chia, L. (2004). Problem-based learning: Using students 'questions to drive knowledge construction. Science Education, 88, 707-727. Chin, C., & Chia, L. (2005). Problem-based learning: Using III-structured problems in biology project work. Science Education, 90(1), 44-67. Cognition and Technology Group at Vanderbilt (1997). The jasper project: Lessons in curriculum, instruction, assessment, and professional development, Erlbaum, Mahwah, NJ. Cohen, E. G. (1994). Restructuring the classroom: Conditions for productive small groups. Rev. Educ. Res, 64, 1-35. Copland, M. A. (2000). Developing the problem-framing skills of prospective principals. Paper presented at the Annual Meeting of the American Educational Research Association. New Orleans, LA Delisle, R. (2002). How to use problem-based learning in the classroom. Retrieved from http://www.ascd.org/readingroom/books/delisle97book.html DeRidder, L. (1990). The impact of parents and parenting on career development. (Eric Document Reproduction Service No. ED 325796) Dewey, J. (1910). How We Think?. Washington, DC: Health. Dochy, F., Segers, M., van der Bossche, P., & Gijbels, D. (2003). Effects of problem-based learning: A meta-analysis. Learning Instruction, 3, 533-568. Domin, D. S. (1999). A review of laboratory instruction styles. Chemical Education Research, 76(4), 543-547. Duch, B. J. (1996). Problem-based learning in physics: The power of students teaching students. Journal of College Science Teaching, 15, 326-329. Dweck, C. S. (1991). Self-theories and goals: Their role in motivation, personality, and development. In Nebraska Symposium on Motivation, 1990, University of Nebraska Press, Lincoln, pp. 199-235. Eagly, A. H., & Chaiken, S. (1993). The psychology of attitudes. Fort Worth, TX: Harcourt Brace Jovanovich. Easley, & Shawn, L. (2007). ' Problem-Based Learning: An Interactive Approach to the Teaching of American Government, '' Paper presented at the Annual APSA Teaching and Learning Conference, February, Charlotte, NC. Erickson, D. K. (1999). A problem-based approach to mathematics instruction. Math Teach, 92(6), 516-521. Fenwick, T., & Parsons, J. (1998). Boldly solving the world: A critical analysis of problem-based learning as a method of professional education. Studies in the Education of Adults, 30(1), 53-66. Fishbein, M., & Ajzen, I. (1972). Attitudes and normative beliefs as factors influencing behavioral intentions. Journal of Personality & Social Psychology, 21, 1-9. Foshay, R., & Kirkley, J. (1998). Principles for Teaching Problem Solving. http://www.plato.com/whitepapers.asp Gagne', R. M. (1985). The conditions of learning (4th ed.). New York: Holt, Rinehart & Winston. Gallagher, S. A., Stepien, W. J., & Rosenthal, H. (1992). The effects of problem-based learning on problem solving. Gifted Child Q, 36, 195-200. Gallagher, S. A., Stepien, W. J., Sher, B. T., & Workman, D. (1995). Implementing problem-based learning in science classrooms. School Science & Mathematics, 95(3), 136-146. Garfield, J. B. (1977). An investigation of junior high school students 'attitudes toward components of Mathematics. Unpublished master thesis, University of Minnesota. Go"ral, M. (2010). The affect of sport activities on problem solving skills (sample of bursa province). European Journal of Educational Studies, 2(2), 101-110. Greenwald, N. L. (2000). Learning from problems. The Science Teacher, 67 (4), 28-32. Goodnough, K. (2003). Enhancing pedagocigal content knowledge through selfstudy: An exploration of problem-based learning. Teaching in Higher Education, 11(3), 301-318. Hargreaves, M., Homer, M., & Swinnerton, B. (2008). A comparison of performance and attitudes in mathematics amongst the 'gifted'. Are boys better at mathematics or do they just think they are? Assessment in Education: Principles, Policy & Practice, 15(1), 19-38. Hemmings, B., & Kay, R. (2010). Prior achievement, effort, and mathematics attitude as predictors of current achievement. Australian Educational Researcher (Australian Association for Research in Education), 37(2), 41-58. Hmelo, C. E. (1998). Problem-based learning: Effects on the early acquisition of cognitive skill in medicine. J. Learn. Sci., 7, 173-208. Hmelo, C. E., Holton, D., & Kolodner, J. L. (2000). Designing to learn about complex systems. J. Learn. Sci., 9, 247-298. Hmelo, C. E., & Lin, X. (2000). The development of self-directed learning strategies in problem-based learning. In D. Evensen & C. E. Hmelo (eds.), Problem-based learning: Research perspectives on learning interactions (pp. 227-250), Mahwah, NJ: Erlbaum. Hmelo-Silver, C. E. (2000). Knowledge recycling: Crisscrossing the landscape of educational psychology in a problem-based learning course for preservice teachers. J. Excell. Coll. Teach. 11, 41-56. Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? Educational Psychology

Review, 16(3), 235-266. Hong, Z. R. (2010). Effects of a collaborative science intervention on high achieving students' learning anxiety and attitudes toward science. International Journal of Science Education, 32(15), 1971-1988. Hsieh, C., & Knight, L. (2008). Problem-based learning for engineering students: An evidence-based comparative study. Journal of Academic Librarianship, 35(1), 25-30. Karagiorgi, Y., & Symeou, L. (2005). Translating constructivism into instructional design: Potential and limitations. Educational Technology & Society, 8(1), 17-27. Kenny, R. F., Bullen, M., & Loftus, J. (2006). Problem formulation and resolution in online problem-based learning. International Review of Research in Open & Distance Learning, 7(3), 1-21. Kind, P. M., Jones, K., & Barmby, P. (2008). Examining changing attitudes in secondary school science. International Journal of Science Education, 30(8), 1075-1093. Koballa, T. R. (1988). Attitude and related concepts in science education. Science Education, 72, 115-126. Kolodner, J. L. (1993). Case-based reasoning, Morgan Kaufmann, San Mateo, CA. Krynock, K. B., & Robb, L. (1996). Is problem-based learning a problem for your curriculum? Illinois School Research and Development Journal, 33(1), 21-24. Levin, B. B. (2002). Energizing teacher education and professional development with problem-based learning. Lou, S. J., Shih, R. C., Tseng, K. H., Diez, C. R., & Tsai, H. Y. (2010). How to promote knowledge transfer through a problem-based learning internet platform for vocational high school students. European Journal of Engineering Education, 35(5), 539-551. Massa, N. M. (2008). Problem-based learning (PBL): A real-world antidote to the standards and testing regime. New England Journal of Higher Education, 22(4), 19-20. Mayer, R. E. (1985). Implications of cognitive psychology for instruction in mathematical problem solving. In E. A. Silver (Ed.), Teaching and learning mathematical problem solving (pp. 123-138), NJ: Hillsdale, Mayer, R. E. (1992). Thinking problem solving, cognitive. (2nd ed.). New York: W.H. Freeman & Company, McKeachie, W. J. (2002). How to make lectures more effective. In P. Coryell (Ed.), McKeachie 's teaching tips (11th ed., pp. 52-69), Boston: Houghton Mifflin Company. McPhee, A. D. (2002). Problem-based learning in initial teacher education: taking the agenda forward. J. Educ. Enq., 3(1), 60-78. Mendes, J. F. G. (2000). Decision strategy spectrum for the evaluation of quality of life in cities, In Foo Tuan Seik, Lim Lan Yuan & Grace Wong Khei Mie (Eds.), Planning for a better quality of life in cities, School of building and real estate(pp. 35-53). NUS, Singapore. Monasterrsky, R. (2005). Women and science: The debate goes on, Chronicle of Education (Research and Publishing), 51, Friday March 4: A1. Needham, D. R., & Begg, I. M. (1991). Problem-oriented training promotes spontaneous analogical transfer. Memory-oriented training promotes memory for training. Mem. Cogn., 19, 543-557. Ngeow, K., & Kong, Y. (2001). Learning to learn: Preparing teachers and students for problem-based learning. ERIC Clearinghouse on Reading, English, and Communication, Bloomington, IN. Norman, G. R., & Schmidt, H. G. (1992). The psychological basis of problem-based learning: A review of the evidence. Academic Medicine, 67, 557-565. Perfetto, G. A., Bransford, J. D., & Franks, J. J. (1983). Constraints on access in a problemsolving context. Mem. Cogn, 11, 24-31. Plucker, J., & Nowak, J. (1999). How to use problem-based learning in the classroom. Roeper Review, 22(1), 69-70. Polanco, R., Calderon, P., & Delgado, F. (2004). Effects of a problem-based learning program on engineering students ' academic achievements in a Mexican University. Innovations in Education and Teaching International, 41(2), 145-155. Polya, G. (1981). Mathematical discovery: On understanding, learning and teaching problem solving. USA: John Wiley & Sons, Inc. Prokop, P., Tuncer, G., & Chuda', J. (2007). Slovakian students' attitudes toward biology. Eurasia Journal of Mathematics, Science & Technology Education, 3(4), 287-295. Radocy, R. E., & Boyle, J. D. (2003). Psychological foundations of musical behavior (4th ed). Springfield, IL: Charles C. Thomas. Ram, P. (1999). Problem-based learning in undergraduate education. Journal of Chemical Education, 76(8), 1122-1126. Reigeluth, C. M., & Squire, K. (1998). Emerging work on the new paradigm of instructional theories. Educational Technology, 38(4), 41-47. Reynolds, F. (1997) Studying psychology at degree level; Would problem-based learning enhance students 'experiences? Stud High Educ. 22(3), 263-275, Reynolds, J. M., & Hancock, D. R. (2010). Problem-based learning in a higher education environmental biotechnology course. Innovations in Education & Teaching International, 47(2), 175-186. Ribeiro, L. R. C., & Mizukami, M. G. N. (2005). Problem-based learning: a student evaluation of an implementation in postgraduate engineering education. European Journal of Engineering Education, 30 (1), 137-149. Ryan, J. (2005). Brains or men and women only part of story in science, San Francisco Chronicle, Thursday March 3 p.B1 Sage, S. M., & Torp, L. T. (1997). What does it take to become a teacher of problembased learning? Journal of Staff Development, 18, 32-6. Sahin, M. (2010). Effects of Problem-Based Learning on University Students ' Epistemological Beliefs About Physics and Physics Learning and Conceptual Understanding of Newtonian Mechanics. Journal of Science Education & Technology, 19(3), 266-275. Said, S. M., Adikan, F.R., Mekhilef, S., & Rahim, N. (2005). Implementation of the problem-based learning approach in the department of electrical engineering, university of Malaya. Eur J Eng Educ, 30(1), 129-136. Samford University. (2005). Problem based learning at Samford University. Retrieved May 15, 2005. Schmidt, H. G., DeVolder, M. L., De Grave, W. S., Moust, J. H. C., & Patel, V. L. (1989). Explanatory models in the processing of science text: The role of prior knowledge activation through small-group discussion. J. Educ. Psychol, 81, 610-619. Schmidt, H. G. (1993). Foundations of problem-based learning: Some explanatory notes. Medical Education, 27, 422-432. Schoenfeld, A. H. (1985). Mathematical Problem Solving, Academic Press, Orlando, FL. Schwartz, D. L., & Bransford, J. D. (1998). A time for telling, Cogn. Instr, 16, 475-522. Searight, H. R., & Searight, B. K. (2009). Implementing problem-based learning in an undergraduate psychology course. InSight: A Journal of Scholarly Teaching, 4, 69-76. Smith, C. A. (1999). Problem-based learning. Biochemical Education, 27(3), 157-169. Solso, R. L. (1998). Cognit ive psychology. (5th ed.). Boston: Al lyn and Bacon. Stahl, R. J. (1994). The essential elements of cooperative learning in the classroom. ERIC Clearinghouse for Social Studies. Social Science Education Bloomington IN. ED370881. Stedman, J., Wood, J., Curle, C. & Haslam, C. (2005). Development of PBL in the training of clinical psychologists. Psychology Learning and Teaching, 5, 52-60. Sternberg, J. R. (1996). Cognit ive psychology. Or lando, FL: Harcourt Brace & Company. Sungur, S., Tekkaya, C., & Geban, O. (2006). Improving achievement through problembased learning. Journal of Biological Education, 40(4), 155-160. Super, D. E. (1994). A life-span, life-space perspective on convergence. In M. L. Savickas & R. W. Lent (Eds.), Convergence in career development theories (pp. 63-79). Palo Alto, California:

Consulting Psychologists Press. Torp, L., & Sage, S. (2002). Problems as possibilities: Problem-based learning for K – 12 education, 2nd edn., ASCD, Alexandria, VA. Vernon, D. A., & Blake, R. L.(1993). Does Problem-based Learning Work? A metaanalysis of evaluative research. Academic Medicine, 68(7), 550-563. Wallas, G. (1926). The arts of thought. Jonathan Cape, 79-96. Webb, N. M., & Palincsar, A. S. (1996). Group processes in the classroom. In D. Berliner and R. Calfee (Eds.), Handbook of Educational Psychology (pp. 841-876). New York, NY: MacMillan. Wenger, E. (1998). Communities of practice: Learning, meaning, and identity, Cambridge University Press, New York. Williams, S. M. (1992). Putting case based learning into context: Examples from legal, business, and medical education. J. Learn. Sci., 2, 367-427. Wood, J. (2004). Report of PBL implementation in D. Clin. Psych. Programme. Exeter, School of Psychology: University of Exeter. Zimmerman, B. (2002). Becoming a self-regulated learner: An overview. Theory Pract, 41, 64-71.