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在問題本位學習模式中國小學生的減塑行為認知與態度決策改變之影響因子

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摘要

本研究旨在探究問題本位學習模式是否能有效提高學生減塑行為的認知與態度。另外也想瞭解性別、同儕影響、具體環境知識、獲得環境資訊的媒介、在地環境參與度、父母的影響、環保意識等因子對學生減塑行為認知與態度決策改變之影響。本研究採準實驗研究設計，實驗組 58 人(兩組不同的實驗介入)及控制組 28 人，共計 85 人。研究結果發現：(1)本課程能有效提高學生的認知和態度；(2)同儕影響、具體環境知識、獲得環境資訊的媒介為影響學生減塑行為認知表現的重要因子；(3)性別為影響學生減塑行為態度的重要因子；(4)在地環境參與度、父母的影響、環保意識對認知和態度皆無影響。依研究結果及對未來的研究提出多項研究建議。

關鍵字： 決策樹分析、問題本位學習模式、減塑行為認知與態度、影響因子

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保意識之研究工具上未能有效且精確的控制混淆變項，因此建議下次進行研究時可針對這幾個向度進行更進一步的釐清，以修正和改進研究工具。

2. 未來能進行更大規模的研究或縱貫研究

由於本研究的研究參與者不多，未來若能再做一次相關之研究，希冀能提高研究參與者的數量。另外，本研究採橫斷式的資料蒐集，進一步找出影響學生減塑行為認知和態度的重要因子，未來可針對本研究提出來的重要因子，進行縱貫式的資料蒐集。進一步與本研究進行對照，增加研究的可靠性。

陸、參考文獻

黃基森(2002)。論述購物用塑膠袋及塑膠類免洗餐具之限制使用政策。**環境教育學刊**，1，123-142。

【Huang, J.-S. (2002). Discussing the restriction policy against plastic shopping bags and plastic disposal dishes. *Chinese Journal of Environmental Education, 1*, 123-142.】

Allen, D. E., Duch, B. J., & Groh, S. E. (1996). The power of problem-based learning in teaching introductory science courses. *New Directions for Teaching and Learning, 68*, 43-52. doi: 10.1002/tl.37219966808

Amel, E. L., Manning, C. M., & Scott, B. A. (2009). Mindfulness and sustainable behavior: Pondering attention and awareness as means for increasing green behavior. *Ecopsychology, 1*(1), 14-25. doi: 10.1089/eco.2008.0005

Asif, R., Merceron, A., Ali, S. A., & Haider, N. G. (2017). Analyzing undergraduate students' performance using educational data mining. *Computer & Education, 113*, 117-194. doi: 10.1016/j.compedu.2017.05.007

Asmuni, S., Hussin, N. B., Khalili, M. J., & Zain, Z. M. (2015). Public participation and effectiveness of the no plastic bag day program in Malaysia. *Procedia - Social and Behavioral Sciences, 168*, 328-340. doi: 10.1016/j.sbspro.2014.10.238

Barrows, H. S. (1996). Problem-based learning in medicine and beyond: a brief overview. *New Directions for Teaching and Learning, 68*, 3-11. doi:

10.1002/tl.37219966804

Barrows, H. S., & Tamblyn, R. B. (1980). *Problem-based learning: an approach to medical education.* New York, NY: Springer. doi: 10.5014/ajot.35.8.539b

Bliese, P. D. (2000). Within-group agreement, non-independence, and reliability: Implications for data aggregation and analysis. In K. Klein, & S. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions* (pp. 349-381). San Francisco, CA: Jossey-Bass.

Bolzan, N., & Heycox, K. (1997). Use of an issue-based approach in social work education. In D. Bound & G. Feletti (eds.), *The challenge of problem-based learning* (pp. 194-202). London, UK: Routledge

Bridges, E. M., & Hallinger, P. (1996). Problem-based learning in leadership education. *New Directions for Teaching and Learning, 68*, 53-61. doi: 10.1002/tl.37219966809

Burke, M. J., Finkelstein, L. M., & Dusig, M. S. (1999). On average deviation indices for estimating interrater agreement. *Organizational Research Methods, 2*, 49-68. doi: 10.1177/109442819921004

Butt, A. (2017). Determinants of the consumers' green purchase intention in developing countries. *Journal of Management Sciences, 4*(2), 217-236. doi: 10.20547/jms.2014.1704205

Collado, S., Staats, H., & Corraliza, J. A. (2013). Experiencing nature in children's summer camps: affective, cognitive and behavioural consequences. *Journal of Environmental Psychology, 33*, 37-44. doi: 10.1016/j.jenvp.2012.08.002

Dagher, G. K., Itani, O., & Kassar, A. N. (2015). The impact of environment concern and attitude on green purchasing behavior: Gender as the moderator. *Contemporary Management Research, 11*, 179-206. doi: 10.7903/cmr.13625

Damerell, P., Howe, C., & Milner-Gulland, E. J. (2013). Child-orientated environmental education influences adult knowledge and household behavior. *Environmental Research Letters, 8*(1), 1-7. doi: 10.1088/1748-9326/8/1/015016

DeJong, C. S., van Lenthe, F. J., der Horst, K., & Oenema, A. (2009). Environmental and cognitive correlates of adolescent breakfast consumption. *Preventive Medicine, 48*(4), 372-377. doi: 10.1016/j.ypmed.2009.02.009

Depledge, M. H., Galgani, F., Panti, C., Caliani, I., Casini, S., & Fossic, M. C. (2013). Plastic litter in the sea. *Marine Environmental Research, 92*, 279-281. doi: 10.1016/j.marenvres.2013.10.002

Dobson, H. E., & Tomkinson, C. B. (2012). Creating sustainable development change agents through problem-based learning: Designing appropriate student PBL projects. *International Journal of Sustainability in Higher Education, 13*(3), 263-278. doi: 10.1108/14676371211242571

Downey, P., & Waters, M. (2005). Developing the primary healthcare team as a learning organization: a new model using problem based learning. *Education for Primary Care, 16*, 301-307.

Du, X.-Y., Su, L.-Y., & Liu, J.-L. (2013). Developing sustainability curricula using the PBL method in a Chinese context. *Journal of Cleaner Production, 61*, 80-88. doi: 10.1016/j.jclepro.2013.01.012

Dunlap, J. C. (2005). Problem-based learning and self-efficacy: How a capstone course prepares students for a profession. *Educational Technology, Research and Development, 53*(1), 65-85. doi: 10.1007/BF02504858

Edens, K. M. (2000). Preparing problem solvers for the 21st century through problem-based learning. *College Teaching, 48*(2), 55-60. doi: 10.1080/87567550009595813

Ezendam, N. P. M., Evans, A. E., Stigler, M. H., Brug, J., & Oenema, A. (2010). Cognitive and home environmental predictors of change in sugar-sweetened beverage consumption among adolescents. *British Journal of Nutrition, 103*(5), 768-774. doi: 10.1017/S0007114509992297

Faris, R., & Ennett, S. (2012). Adolescent aggression: The role of peer group status motives, peer aggression, and group characteristics. *Social Networks, 34*(4), 371-378. doi: 10.1016/j.socnet.2010.06.003

Fremerey, C., & Bogner, F. X. (2015). Cognitive learning in authentic environments in relation to green attitude preferences. *Studies in Educational Evaluation, 44*, 9-15. doi: 10.1016/j.stueduc.2014.11.002

Genc, M. (2015). The project-based learning approach in environmental education. *International Research in Geographical and Environmental Education, 24*(2), doi: 10.1080/10382046.2014.993169

Green, D. S., Boots, B., Blockley, D. J., Rocha, C., & Thompson, R. (2015). Impacts of discarded plastic bags on marine assemblages and ecosystem functioning. *Environmental Science & Technology, 49* (9), 5380-5389. doi: 10.1021/acs.est.5b00277

Grønhøj, A., & Thøgersen, J. (2009). Like father, like son? Intergenerational transmission of values, attitudes, and behaviours in the environmental domain. *Journal of Environmental Psychology, 29*(4), 414-421. doi: 10.1016/j.jenvp.2009.05.002

Grønhøj, A., & Thøgersen, J. (2012). Action speaks louder than words: The effect of personal attitudes and family norms on adolescents' pro-environmental behavior. *Journal of Economic Psychology, 33*(1), 292-302. doi: 10.1016/j.joep.2011.10.001

Jayaraman, K., Haron, H., Sung, G. B., & Lin, S. K. (2011). Consumer reflections on the usage of plastic bags to parcel hot edible items: an empirical study in Malaysia. *Journal of Cleaner Production, 19*(13), 1527-1535. doi: 10.1016/j.jclepro.2011.03.019

Joseph, N., Rai, S., Madi, D., Bhat, K., Kotian, S. M., & Kantharaju, S. (2016). Problem-based learning as an effective learning tool in community medicine: Initiative in a private medical college of a developing country. *Indian Journal of Community Medicine, 41*(2), 133-140. doi: 10.4103/0970-0218.177535

Karunarathna, W. R. A. D., Naotunna, S. S., & Sachitra, K. M. V. (2017). Factors affect to green products purchase behavior of young educated consumers in Sri Lanka. *Journal of Scientific Research and Reports, 13*(2), 1-13. doi: 10.9734/JSRR/2017/32204

Kolbe, K. D. (2015). Knowledge, attitudes and behaviour regarding waste management in a grammar and a comprehensive school in England: Results from a school questionnaire. *Journal of Teacher Education for Sustainability, 17*(1), 58-71. doi: 10.1515/jtes-2015-0005

Lee, K. (2009). Gender differences in Hong Kong adolescent consumers' green purchasing behavior. *Journal of Consumer Marketing, 26*(2), 87-96. doi: 10.1108/07363760910940456

Lee, K. (2010). The green purchase behavior of Hong Kong young consumers: The role of peer influence, local environmental involvement, and concrete environmental knowledge. *Journal of International Consumer Marketing, 23*(1), 21-44. doi: 10.1080/08961530.2011.524575

Leppänen, J. M., Haahla, A. E., Lensu, A. M., & Kuitunen, M. T. (2012). Parent-child similarity in environmental attitudes: a pairwise comparison. *The Journal of Environmental Education, 43*(3), 162-176. doi: 10.1080/00958964.2011.634449

Lu, L.-T., Hsiao, T.-Y., Shang, N.- C., Yu, Y.-H., & Ma, H.-W. (2005). MSW management for waste minimization in Taiwan: The last two decades. *Waste Management, 26*(6), 661-667. doi: 10.1016/j.wasman.2005.10.005

Luís, I. P., & Spínola, H. (2010). The influence of a voluntary fee in the consumption of plastic bags on supermarkets from Madeira Island (Portugal). *Journal of Environmental Planning and Management, 53*(7), 883-889. doi: 10.1080/09640568.2010.490054

Martin, B., & Simintiras, A. C. (1995). The impact of green product lines on the environment: does what they know affect how they feel? *Marketing Intelligence & Planning, 13*(4), 16-23. doi: 10.1108/02634509510088991

Martinho, G., Balaia, N., & Pires, A. (2017). The Portuguese plastic carrier bag tax: the effects on consumers' behavior. *Waste Management, 61*, 3-12. doi: 10.1016/j.wasman.2017.01.023

Megens, K. C. I. M., & Weerman, F. M. (2012). The social transmission of

delinquency: Effects of peer attitudes and behavior revisited. *Journal of Research in Crime and Delinquency, 49*(3), 420-443. doi: 10.1177/0022427811408432

Mikami, A. Y., Szwedo, D. E., Allen, J. P., Evans, M. A., & Hare, A. L. (2010). Adolescent peer relationships and behavior problems predict young adults' communication on social networking websites. *Developmental Psychology, 46*(1), 46-56. doi: 10.1037/a0017420

Mostafa, M. M. (2009). Shades of green: a psychographic segmentation of the green consumer in Kuwait using self-organizing maps. *Expert Systems with Applications, 36*(8), 11030-11038. doi: 10.1016/j.eswa.2009.02.088

Muralidharan, S., & Sheehan, K. (2018). The role of guilt in influencing sustainable pro-environmental behaviors among shoppers. *Journal of Advertising Research, 58*(3), 349-362. doi: 10.2501/JAR-2017-029

Onwezen, M. C., Reinders, J., & Sijtsema, S. J. (2017). Understanding intentions to purchase bio-based products: the role of subjective ambivalence. *Journal of Environmental Psychology, 52*, 26-36. doi: 10.1016/j.jenvp.2017.05.001

Qader, I. K. A., & Zainuddin, Y. B. (2010). Intention to purchase green electronic products: The consequences of perceived government legislation, media exposure and safety & health concern and the role of attitude as mediator. *International Journal of Innovation, Management and Technology, 1*(4), 432-440.

Qader, I. K. A., & Zainuddin, Y. B. (2011a). The impact of media exposure on intention to purchase green electronic products amongst lecturers. *International Journal of Business and Management, 6*(3), 240-248. doi: 10.5539/ijbm.v6n3p240

Qader, I. K. A., & Zainuddin, Y. B. (2011b). The influence of media exposure, safety and health concerns, and self-efficacy on environmental attitudes towards electronic green products. *Asian Academy of Management Journal, 16*(2), 167-186.

Redshaw, C. H., & Frampton, I. (2014). Optimising inter-disciplinary problem-based

learning in postgraduate environmental and science education: recommendations from a case study. *International Journal of Environmental and Science Education, 9*, 97-110.

Reynolds, J. M., & Hancock, D. R. (2010). Problem-based learning in a higher education environmental biotechnology course. *Innovations in Education and Teaching International, 47*(2), 175-186. doi: 10.1080/14703291003718919

Rivers, N., Shenstone-Harris, S., & Young, N. (2017). Using nudges to reduce waste? The case of Toronto's plastic bag levy. *Journal of Environmental Management, 188*, 153-162. doi: 10.1016/j.jenvman.2016.12.009

Scherer, C., Emberger-Klein, A., & Menrad, K. (2017). Biogenic product alternatives for children: Consumer preferences for a set of sand toys made of bio-based plastic. *Sustainable Production and Consumption, 10*, 1-14. doi: 10.1016/j.spc.2016.11.001

Scherer, C., Emberger-Klein, A., & Menrad, K. (2018). Segmentation of interested and less interested consumers in sports equipment made of bio-based plastic. *Sustainable Production and Consumption, 14*, 53-65. doi: 10.1016/j.spc.2018.01.003

Tak, N. I., Te Velde, J. S., Oenema, A., Van der Horst, K., Timperio, A., Crawford, D., & Brug, J. (2011). The association between home environmental variables and soft drink consumption among adolescents. Exploration of mediation by individual cognitions and habit strength. *Appetite, 56*(2), 503-510. doi: 10.1016/j.appet.2011.01.013

Vasconcelos, C. (2012). Teaching environmental education through PBL: Evaluation of a teaching intervention program. *Research in Science Education, 42* (2), 219-232.

Wagner, T. P. (2017). Reducing single-use plastic shopping bags in the USA. *Waste Management, 70*, 3-12. doi: 10.1016/j.wasman.2017.09.003

Whitmarsh, L., & O'Neill, S. (2010). Green identity, green living? The role of pro-

environmental self-identity in determining consistency across diverse pro-environmental behaviours. *Journal of Environmental Psychology, 30*(3), 305-314. doi: 10.1016/j.jenvp.2010.01.003

Xiao, C.-Y., & Hong, D.-Y. (2010). Gender differences in environmental behaviors in China. *Population and Environment, 32*(1), 88-104. doi: 10.1007/s11111-010-0115-z

Xiao, C.-Y., & McCright, A. M. (2013). Gender differences in environmental concern: Revisiting the institutional trust hypothesis in the USA. *Environment and Behavior, 47*(1), 17-37. doi: 10.1177/0013916513491571

Young, J. T. N., Rebellon, C. J., Barnes, J. C., & Weerman, F. M. (2013). Unpacking the black box of peer similarity in deviance: Understanding the mechanisms linking personal behavior, peer behavior, and perceptions. *Criminology, 52*(1), 60-86. doi: 10.1111/1745-9125.12029

Zelezny, L. C., Chua, P.-P., & Aldrich, C. (2010). New ways of thinking about environmentalism: Elaborating on gender differences in environmentalism. *Journal of Social Issues, 56*(3), 443-457. doi: 10.1111/0022-4537.00177

Zsóka, A., Szerényi, Z. M., Széchy, A., & Kocsis, T. (2013). Greening due to environmental education? Environmental knowledge, attitudes, consumer behavior and everyday pro-environmental activities of Hungarian high school and university students. *Journal of Cleaner Production, 48*, 126-138. doi: 10.1016/j.jclepro.2012.11.030

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Factors Affecting Primary School Students on Cognition of Plastic Reduction Behavior and Decision-Making Attitude in Problem-Based Learning

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Abstract

This study explored whether the environmental protection curriculum designed with PBL could effectively improve students' awareness and attitudes of plastic reduction behavior. The researcher investigate into whether gender, peer influence, specific environmental knowledge, media exposure to environmental information, participation in local environmental activities, and environmental awareness were essential factors affecting students' cognition of plastic reduction behavior and decision-making attitude. In this study, the researchers applied quasi-experimental design and cluster sampling. A total of 85 people participated, with 58 people in the experimental group (divided into two groups due to different experimental interventions) and 28 people in the control group. The results are as follows: (1) This course can effectively improve students' cognition and attitude; (2) Peer influence, specific environmental knowledge, and media exposure to environmental information are important factors that affect students' cognitive performance in plastic reduction behavior; (3) Gender is an important influencing factor on students' attitudes towards plastic reduction behavior; (4) Participation in local environmental activities, parental influence, and environmental awareness have no effect on cognition and attitude. The results provided valuable pedagogical suggestions for future research.

Keywords: decision tree analysis, problem-based learning, plastic reduction behavioral cognition and attitudes, impact factors