The Impact of Expectancy-value, Learning Experience, and School Environment on High School Students' Science Inquiry Competence Performance

Hsiao-Fang, Lin

***Abstract*—**The purpose was to explore the complex context of high school students in scientific inquiry competence and affective performance. There were 526 high school students as subjects. The results showed that gender in scientific inquiry performance, expectancy-value, and learning experience had powerful explanation, and boys' score were higher than girls; second, higher and positive Pearson correlation among interest in science, scientific activities involved, and positive learning experience; third, performance of scientific decision-making significantly related to scientific interest; fifth, when teachers were attentive to students, students' expectancy-value and learning experience were more better.

***Keywords*—**Expectancy-value, Learning Experience, School Environment, High School Students, Science Inquiry Competence

I. Introduction

THE purpose of this study was to explore the complex context of high school students in scientific inquiry competence and affective performance. The affective questionnaire content was referenced by PISA2006 student attitude questionnaire, selected appropriate questions and made modifications as the main tool of the investigation of this study.

II. Method

The 526 high school students as subjects, the affective questionnaire data as the independent variable, and collected experimental teaching and assessment results as structural equation model dependent variables. Family resources and school environment were exogenous variables of the structural equation model, and through the moderator, value expectations, attending math and science cram school time, and learning experience, to explore high school students in scientific inquiry-oriented (problem-solving, decision-making, argumentation) performance, and also discussed the background variables' influence on the performance of scientific inquiry-oriented competence.

III. Conclusion

The results showed that the school environment, family resources and learning experience through value expectations affected scientific inquiry-oriented competence; Secondly, the school environment had a direct effect of scientific inquiry-oriented competence; third, the school environment also explained the attending math and science cram school time(see fig.1 and table1). About the background variables, the interactions of the parents' education level on the students take the initiative to participate was significant; Second, gender in scientific inquiry-oriented performance (problem-solving, decision-making, argumentation), value expectations (interest, cost), and learning experience (positive learning feelings)had powerful explanation, and boys' scores were higher than girls; third, completely no attending math cram school or spent a lot of time (5-6 hours per week) in math cram school, scientific interest higher significantly; fourth, higher Pearson correlation among interest in science, scientific activities involved, and positive learning experience; beside, the performance of scientific decision-making significantly related to scientific interest; fifth, when teachers were attentive to students, students' value expectations and learning experience were more better. Based on the above research results, provide relevant recommendations to the staff of the high school science education.

Hsiao-Fang, Lin is with the Graduate Institute of Curriculum and Instruction, MingDao University, 369 Wen-Hua Rd., Peetow, ChangHua 523, TAIWAN, (corresponding author to provide phone: 886-4-8876660ext7355 ; fax: 886-4-887666; email:snoopystock100@gmail.com).

This paper was facilitated by grants from the National Science Committee of Taiwan (NSC 100-2511-S-451-002-)

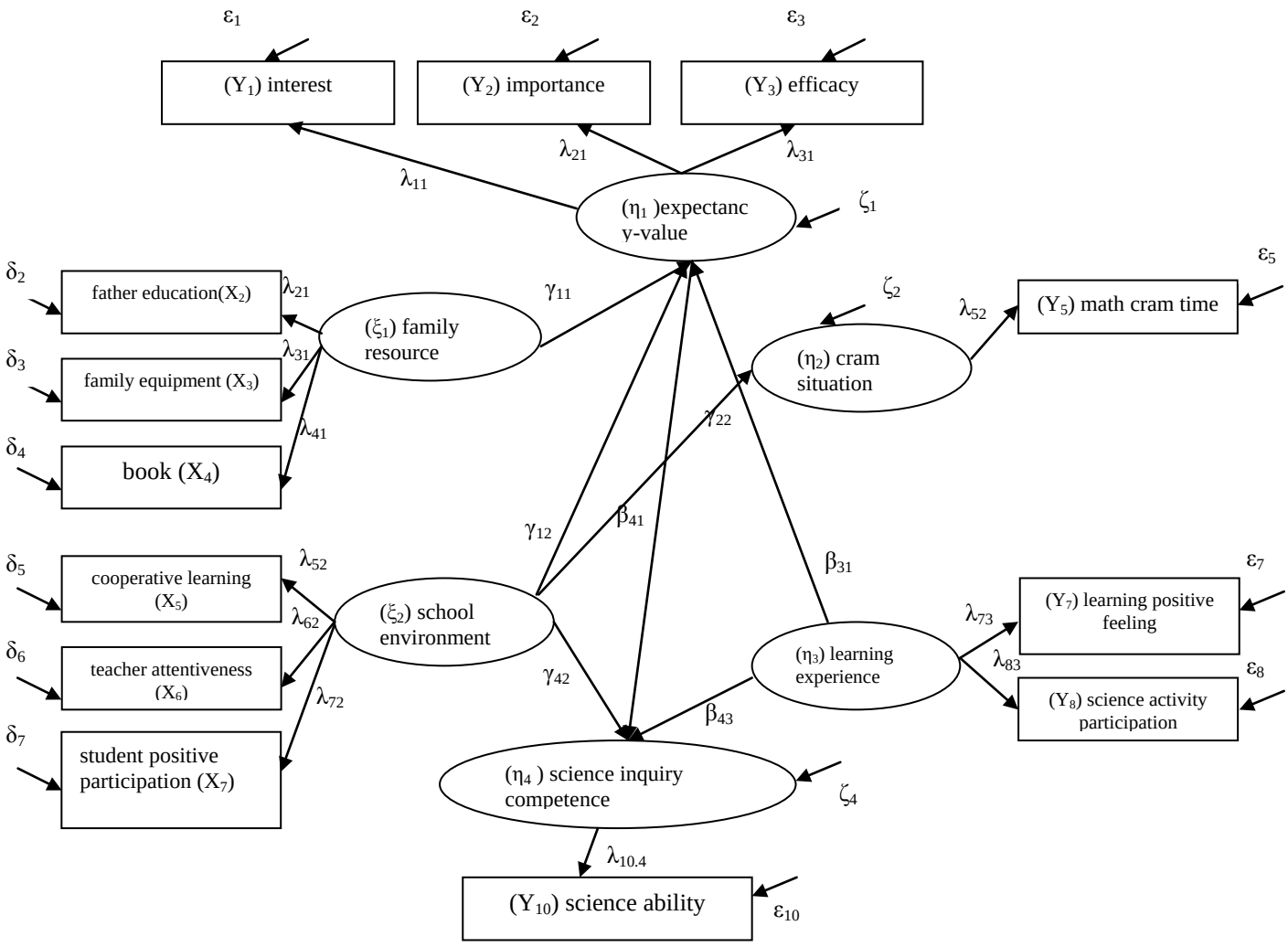

Fig. 1
Structural model

Table 1
Standardized parameter estimate of structural equation model

parameter	estimate	parameter	estimate	parameter	estimate	parameter	estimate	parameter	estimate
λ^x_{21}	.43	δ_2	.82	λ^y_{11}	.78	ε_1	.39	γ_{11}	-.14
λ^x_{31}	.63	δ_3	.60	λ^y_{21}	.19	ε_2	.97	γ_{12}	.00
λ^x_{41}	.73	δ_4	.47	λ^y_{31}	.66	ε_3	.57	γ_{22}	-.06
λ^x_{52}	.38	δ_5	.85	λ^y_{52}	1.00*	ε_5	.00	γ_{42}	-.03
λ^x_{62}	.67	δ_6	.55	λ^y_{73}	.60	ε_7	.64	β_{31}	1.12
λ^x_{72}	.60	δ_7	.64	λ^y_{83}	.65	ε_8	.58	β_{41}	.29
				$\lambda^y_{10.4}$	1.00*	ε_{10}	.00	β_{43}	-.20

ps：*latent variable only include one observation variable

REFERENCES

[1] Ann, M. L. C., & Michelle, R. (2004). Gender differences, Curricula, Learning, Teaching methods, Physics, College students, Academic achievement, Comparative analysis. *School Science and Mathematics, 104,* 288-300.

[2] Bandura, A.(1991). Social cognitive theory of self regulation. *Organizational Behavior and Human Decision Process, 50,* 248-287.

[3] Cavallo, A. M.L.(1994). Do females learn biological topics by rote more than males? *The American Biology Teacher, 56,* 348-352.

[4] Cohen, J. (1988). *Statistical power analysis for the behavioral sciences (2nd ed.).* Hillsdale, NJ: Erlbaum

[5] Cohen, J. (1992). A power primer. *Psychological Bulletin, 112 (1),* 155-159.
[6] Easton, A. (1976). *Decision making : a short course in problem solving for professionals*. New York, NY: Wiley.
[7] Eccles, J. S., & Wigfield, A. (1995). In the mind of the actor: The structure of adolescents' achievement task values and expectancy-related beliefs. *Personality and Social Psychology Bulletin, 21*, 215, 225.
[8] Gagne, E. D., Yekovich, C. W., & Yekovich, F. R. (1993). *The cognitive psychology of school learning* (2nd ed.). New York: Harper Collins.
[9] Gauld, C. (1982). The scientific attitude and science education: A critical reappraisal. *Science Education, 66*(1), 109-121.
[10] Jacobs, J. E. (1991). Influence of gender stereotypes on parent and child mathematics attitudes. *Journal of Educational Psychology, 83*(4), 518-527.
[11] Koballa, T. R., & Crwley, F. E.(1985). The influence of attitude on science teaching and learning. *School Science and Mathematics, 85(3),* 222-232.
[12] Kuhn, D. (1992). Thinking as argument. *Harvard Educational Review*, 62, 155-178.
[13] Liakopoulos, M. (2000). Argumentation Analysis. In W. B. Martin & G. George (Eds.), *Qualitative researching with text, image and sound: a practical handbook*
[14] Ma, X. (2000). A longitudinal assessment of antecedent course work in mathematics and subsequent mathematical attainment. *The Journal of Educational Research, 94* (2), 101-112.)
[15] Paulson, K., & Johnson, M. (1983). Sex role attitudes and mathematical ability in 4^{th}-, 8^{th}-, and 11^{th}-grade students frim a high socioeconomic area. *Developmental Psychology, 19*, 210-214.
[16] Ridley, D. R., Novak, J. D. (1983). Sex-related differences in high school science and mathematics enrollments: Do they give males a critical head start toward science- and math-related careers? *The Alberta Journal of Educational Research, 29*(4), 308-318.
[17] Schibeci, R. A. (1989). Home, school and peer group influences on student attitudes and achievement in science. *Science education, 73*(1), 13-24.
[18] Talton, E. L., & Simpson, R. D.(1986). Relationships of attitude toward self, family, and school with attitudes toward science among adolescents. *Science Education, 70*(4), 365-374.
[19] Wubbels, T., & Levy, J. (Eds.). (1993). *Do you know what you look like? Interpersonal relationships in education*. London: Falmer Press.