

Inquiry-Based Teaching, Attitude Towards Science and STEM Career Aspiration: Gender Perspective

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INTRODUCTION

Under-representation of women in STEM fields has been a global issue. Social psychological research explains that the gender gap in STEM jobs is associated with differences in attitudes towards science rather than scientific ability (Hyde, 2014).

Inquiry-based teaching (IBT) has been highlighted in science education as an effective tool to enhance students' interest and motivation in science. Girls are less likely to be exposed to science activities in their daily life. In addition, they are more likely to experience negative stereotypes in science class (Gunderson et al., 2012). As IBT is designed towards including all students, it might create more positive attitudes towards science for students regardless of gender.

However, little is known about whether the effect of IBT is equitable between boys and girls regarding their attitudes and career aspirations towards science. Prior studies have focused on the value of IBT on cognitive skills. In this study, I explored whether IBT is associated with students' attitudes towards science and career aspirations with a gender perspective.

Method

Data: 2015 PISA Survey for Korea, students aged 15 (N=5,581)

Key variables

STEM career aspiration

The PISA 2015 provides students' self-reports on "What kind of job do you expect to have when you are about 30 years old?" I created binary variable *STEM* as well as sub-fields of STEM (*Health Professionals*, and *Engineering/ICT/ Technician*)

Attitude towards science

PISA index of science self-efficacy, utility value, and enjoyment are used.

Inquiry-based teaching (IBT)

PISA inquiry-based instruction index is drawn from nine questions about pupils' self reports on the frequency of IBT.

Method (continued)

Analysis

- I applied OLS regression to identify the association between IBT and attitudes towards science, and logistic regressions to identify the association between IBT and STEM career aspirations.
- Next, I added interaction between gender and IBT to test how the IBT effects varied by gender.

Results

OLS REGRESSION ANALYSIS

	Self-Efficacy	Utility Value	Enjoyment
IBT	0.173*** (0.019)	0.144*** (0.016)	0.185*** (0.018)
Female	0.044 (0.039)	-0.183*** (0.033)	-0.286*** (0.036)
Female x IBT	0.019 (0.030)	0.030 (0.026)	0.036 (0.028)

Notes: Regression control for student characteristics (gender, science test score, socio-economic status, parents' education, parents' occupation), as well as school characteristics (location, size, sector, number of science activities). Standard errors are in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

LOGISTIC REGRESSION ANALYSIS

	STEM	Health Professionals	Engineer / ICT / Technician
IBT	1.004 (0.045)	0.982 (0.078)	1.014 (0.053)
Female	0.726*** (0.067)	1.969*** (0.260)	0.310*** (0.042)
Female x IBT	1.024 (0.076)	1.026 (0.106)	1.074 (0.121)

Notes: Odds ratios are reported. The reference category is non-STEM. For columns 2 and 3, estimates are from multinomial logistic regressions. Regression control for student characteristics (gender, science test score, socio-economic status, parents' education, parents' occupation), as well as school characteristics (location, size, sector, number of science activities). Standard errors are in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

- A higher frequency of IBT is positively and significantly associated with attitude towards science (self-efficacy, enjoyment and utility value), but not significantly associated with STEM career aspirations.
- There are no significant interactions between IBT and gender.

Discussion

- IBT can be an inclusive science education tool to facilitate pupils' attitudes toward science, regardless of gender.
- However, the frequency of IBT is not associated with STEM career aspirations, regardless of gender.
- Unobserved factors might be particularly relevant in promoting students' science career aspirations. When it comes to college major choice or career aspirations by gender, pre-determined factors (i.e. social norms) might play a bigger role. Parents also tend to play a role in their children's career aspiration development in Korea (Kim & Bang, 2017). Some of them influence their children based on their own interests, rather than the children's.
- It is worth noting that this study uses the frequency of IBT, which does not address the quality aspect (i.e., classroom practices or norms). IBT, which is time-consuming, might not be properly executed in Korea, due to insufficient time, tight curriculum, large class size, low confidence in teaching and practicing inquiry (Kim et al., 2010) as well as preoccupation with college test preparation.

Conclusion

IBT can be an effective, inclusive science education tool to facilitate pupils' self-efficacy, utility value, and enjoyment, regardless of gender in Korea.

Much effort has been focused on raising test scores in Korea; however, to ensure gender diversity in STEM, facilitating positive attitudes towards science should not be overlooked in favor of test preparation in Korea.

Reference

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