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Research Paper

The Relationship between Investigative Courses and Learning Outcomes: Exploring the Mediating Effects of Students' Engagement Levels

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Abstract

Aim: The purpose of current study was to investigate the structural relationships between the investigative courses and students' learning outcomes, mediated by students' engagement levels including high-level thinking, classroom efforts, participatory learning, faculty-student interaction, interpersonal relationships, and institutional supports. Research method was descriptive with a correlational design. The results showed that the model fitted the data well and explained the relationship between the variables. Also, based on the results, the relationship of investigative courses with high-level thinking, student classroom efforts, participatory learning, and faculty-student interaction was positive and significant. In addition, although the direct effect of the investigative courses on learning outcomes was not significant, its indirect effect, mediated by of participatory learning, was positive and significant. Furthermore, other mediating effects of the components related to levels of engagement were not significant.

Keywords*: Investigative course, Learning outcomes, Level of engagement, University, University student*

Introduction

The present study investigates the relationship between investigative courses and students' learning outcomes considering the mediating role of their levels of engagement in the university learning environments through a structural equation model. Accordingly, the type of students' engagement with their field of study and its curricula, as well as activities related to teaching and learning, such as students' interaction with faculty members as mediator, affect learning outcomes and socialization of students in the university environment. (Deng & Yao, 2020; Ko et al., 2016; Weidman et al., 2001; Weidman, 1989). Research on student engagement in the university environment shows that this variable is significantly related to students' learning outcomes and their academic achievement (Ko et al., 2016; Pike and Kuh, 2005; Pike et al., 2003 Gellin, 2003). The relationship between the field of study and the learning outcomes and academic achievement of students is mainly explained by the Holland's person-environment theory (1997). Holland (1997) classifies students into six personality types or environments: investigative, realistic, artistic, social, enterprising, and conventional (Rocconi et al., 2020; Kim and Sax, 2014). A review of the research literature shows that various studies have investigated the mediating role of student engagement levels in the relationship between the field of study and student learning outcomes. These studies include Kim and Sax (2011), Kim and Sax (2014), Rocconi et al. (2020), Ko et al. (2016), Feldman et al. (2008), and Pike et al. (2012).

Hypotheses: The main hypotheses of the current research are:

1. There is a significant relationship between students' field of study and their levels of engagement.
2. There is a significant relationship between students' levels of engagement and their learning outcomes.
3. There is a significant relationship between students' field of study and learning outcomes, mediated by their levels of engagement.

Methodology

The present research is descriptive and employs a correlational design. The participants of the study were 5759 undergraduate students from faculties of mathematics and computer, science, technology and engineering, and physics at Shahid Bahonar University of Kerman. Using proportional stratified sampling method, a sample of 360 student were selected. Data were collected using a questionnaire adopted from Pike et al. (2012). It includes 7 subscales and 28 items. To examine items related to the variables of high-level thinking, academic effort, collaborative learning, faculty-student interaction, institutional supports, and learning outcomes, we used a

Likert-type scale ranging from 1 (always) to 4 (never). Also, to measure the items related to the variable of interpersonal relations, the seven-point scale of Ozgood was used. Questionnaires were randomly distributed among the participants and collected after completion. The students' participation in completing the questionnaire was completely voluntary. In order to calculate the reliability of the instrument, the internal consistency method and estimation of the Cronbach's alpha coefficient were used. The total reliability of the questionnaire was calculated to be 0.78, that is acceptable (Field et al., 2012). In order to estimate the construct validity of the questionnaire, confirmatory factor analysis method was used via LISREL software. In the initial analysis, one item from the variable "teacher-student interaction" and two items from the variable "learning outcomes" were removed from the questionnaire due to the 0.30 cut-off point.

Results

Table 1: Fitness indices of structural equation model.

Index	χ^2	df	df/χ^2	Sig	RMSEA	SRMR	NFI	NNFI	CFI
Model	599.27	278	1.11	0.000	.049	.074	.86	0.91	.92
Cut-off value	-	-	<3	<.05	<.08	<.08	>.90	>.90	>.90

Table 1 shows the fit indices of the structural equation model. The results showed the acceptable fit indices. (SRMR = 0.074, RSMEA = 0.049, p = 0.000, df = 278, 599.27). The results also showed that (NFI) = 0.86, (NNFI) = 0.91, and (CFI) = 0.92 (CFI), which indicates the acceptable fit. Also, RMSEA was less than 0.05 and SRMR was less than 0.08, which revealed a very good fit. Figure 1 shows the direct relations between the variables. Accordingly, the relationship between investigative courses and learning outcomes was not significant ($R^2 = 0.69$, $p < 0.05$, $t = -0.69$, $\beta = -0.06$). The results also suggested that the relationship between investigative courses and high-level thinking was positive and significant ($R^2 = 0.14$, $p < 0.01$, $t = 6.4$, $\beta = 0.38$). In this regard, 14% of the variance of higher-level thinking was explained by investigative courses. Also, the relationship between investigative courses and academic efforts ($R^2 = .02$, $p < 0.01$, $t = 3.64$, $\beta = 0.24$) was positive and significant. Therefore, only 0.02% of the variance of students' academic efforts was explained by the field of study. Moreover, the relationship between investigative courses and participatory learning ($R^2 = 0.16$, $p < 0.01$, $t = 3.5$, $\beta = -0.24$) was negative and significant. Accordingly, 16% of the variance of students' participatory learning was explained by the investigative courses. The results also showed that the relationship between investigative courses and faculty-student interaction was negative and significant ($R^2 = 0.29$, $p < 0.01$, $t = 2.64$, $\beta = -0.19$). Thus, 29% of the

variance of faculty-student interaction was explained by investigative courses. In addition, the results indicated that the relationship between investigative courses with institutional supports (R^2 = 0.00, p <0.05, t = -0.86, β = -0.05) and the relationship between investigative courses with interpersonal relationships (R^2 = 0.15, p <0.05, t = 0.37, β = 0.02) were not significant. The results also suggested that the relationship between high-level thinking and learning outcomes (p <0.05, t = 1.31, β = 0.15) and the relationship between interpersonal relationships with learning outcomes were not significant (p <0.05, t = 1.45, β = 0.15). The results also revealed that the relationship between participatory learning and learning outcomes (p <0.01, t = 3.83, β = 0.52) and the relationship between institutional supports and learning outcomes (p <0.01, t 5.55 =, 0.89 = β) were positive and significant. Also, the relationship between academic efforts and learning outcomes (p <0.01, t = 2.61, β = -0.48) and the relationship between faculty-student interaction and learning outcomes (p <0.01, t = -3.69, β = -0.82) were negative and significant. The results also showed that a total of 11% of the variance of students' learning outcomes was explained by predictive variables (i.e., the field of study and each of the levels of student engagement (R^2 = 0.11).

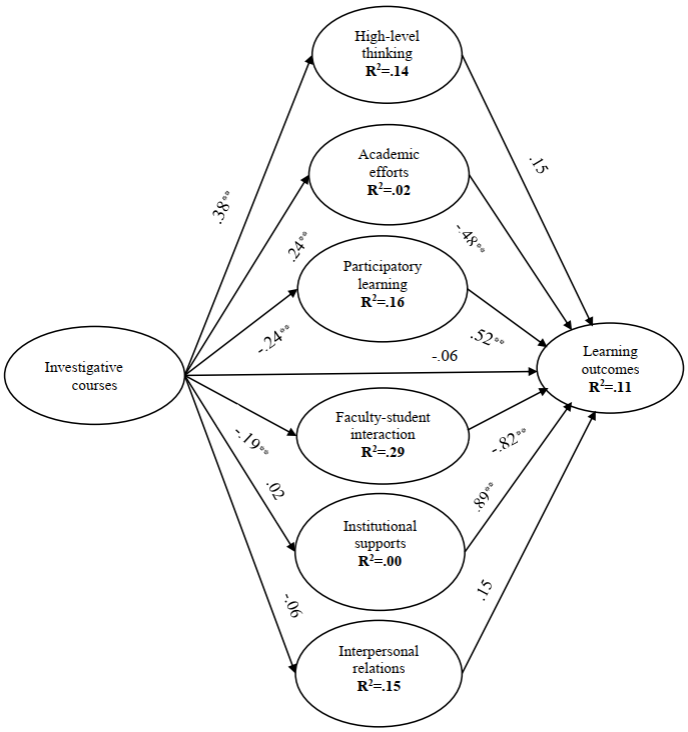

Figure 1: Structural equation model based on standardized path coefficients.

Discussion and conclusion

The results revealed some significant and positive relationships between the variables. In addition, the mediating role of participatory learning, as a subcomponent of students' engagement, was significant. These findings have important implications for teaching and learning in the process of implementing the curricula of investigative courses. The results of the structural equation modeling showed that the model fit the data well. Accordingly, the variables of investigative courses and educational levels explain 11% of the variance of students' learning outcomes. Furthermore, investigative courses explain 16% of the variance of participatory learning, which mediates its role in the relationship between investigative courses and students' learning outcomes. It is therefore suggested that curriculum planners and faculty members pay more attention to improving and strengthening these factors in the structure, content, and implementation of curricula in classrooms. In this regard, the role of the variable "participatory learning" is crucial among the levels of student engagement, because it affects, directly and indirectly, the learning outcomes of students.

Reference

Deng, Y., & Yao, X. (2020). Person-environment fit and proactive socialization: Reciprocal relationships in an academic environment. *Journal of Vocational Behavior*, 120, 1-51.

Feldman, K. A., Smart, J. C., & Ethington, C. A. (2008). Using Holland's theory to study patterns of college student success: The impact of major fields on students. In *Higher Education* (pp. 329-380). Springer, Dordrecht.

Field, A. P., Miles, J., & Field, Z. (2012). *Discovering statistics using R*. Los Angeles, CA: Sage.

Gellin, A. (2003). The effect of undergraduate student involvement on critical thinking: A meta-analysis of the literature, 1991–2000. *Journal of College Student Development, 44*, 746–762.

Holland, J. L. (1997). *Making vocational choices: A theory of vocational personalities and work environment* (3rd ed.). Odessa, FL: Psychological Assessment Resources.

Kim, Y. K., & Sax, L. J. (2011). Are the effects of student-faculty interaction dependent on major? An examination using multi-level modeling. *Research in Higher Education, 52*, 589–615.

Kim, Y. K., & Sax, L. J. (2014). The effects of student–faculty interaction on academic self-concept: Does academic major matter? *Research in Higher Education, 55*, 780-809.

Ko, J. W., Park, S., Yu, H. S., Kim, S. J., & Kim, D. M. (2016). The structural relationship between student engagement and learning outcomes in Korea. *The Asia-Pacific Education Researcher, 25*, 147-157.

Pike, G. R., & Kuh, G. D. (2005). A typology of student engagement for American colleges and universities. *Research in Higher Education*, *46*, 185–210.

Pike, G. R., Kuh, G. D., & Gonyea, R. M. (2003). The relationship between institutional mission and students' involvement and educational outcomes. *Research in Higher Education, 44*, 243–263.

Pike, G. R., Smart, J. C., & Ethington, C. A. (2012). The mediating effects of student engagement on the relationships between academic disciplines and learning outcomes: An extension of Holland's theory. *Research in Higher Education*, *53*, 550-575.

Rocconi, L. M., Liu, X., & Pike, G. R. (2020). The impact of person-environment fit on grades, perceived gains, and satisfaction: an application of Holland's theory. *Higher Education*, 1-18. doi: 10.1007/s10734-020-00519-0

Weidman, J. C. (1989). Undergraduate socialization: A conceptual approach. In J. C. Smart (Ed.), *Higher education: Handbook of theory and research* (Vol. V, pp. 289–323). New York: Agathon.

Weidman, J. C., Twale, D. J., & Stein, E. L. (2001). *Socialization of graduate and professional students in higher education: A perilous passage?* ASHE-ERIC Higher Education Report, Volume 28, Number 3. Jossey-Bass Higher and Adult Education Series. San Francisco, CA: ERIC.