

The Relationship Between Life-Learning Competency and Self-Directed Learning Ability, Problem-Solving Ability, and Academic Achievement of University Students in the Context of Higher Education*

Eunmo SUNG**

National Youth Policy Institute

Korea

The purpose of this study was to examine whether respondents showed gender differences in life-learning competency, self-directed learning ability, problem-solving ability, and academic achievement and to identify relationships among variables of university students in the context of higher education. To address those goal, the data set was analyzed that nationally collected from Korea Youth Competency Measurement and International Comparative Research III by National Youth Policy Institute in South Korea. 680 samples were used in the study that were 343 males and 337 females of university students. As results, statistically significant difference was showed in the participants' gender. Male university students were higher score than female university students in All variables. Also, learning agility in life-learning competency was strongly related to self-directed learning ability and problem-solving. Thinking skills in life-learning competency was strongly related to academic achievement in university students in higher education. In terms of learning strategy in the context of higher education, some suggestions have been made for university students.

Keywords: Life-learning competency, Self-directed learning, Problem-solving, Academic achievement, Gender differences

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** Corresponding Author: National Youth Policy Institute
emsung@nypi.re.kr

Introduction

Changes and challenge in higher education

A recent main issue in higher education is 'student-centered well-taught university'. The government has been continuously promoting educational capacity building for enhancing educational competitiveness through quality management of higher education at national level (Bae & Kim, 2012; MOE, 2013). Also, Universities are attempting to change their competency based curriculum and instructional methods to improve the quality of higher education (Sung, 2017).

Life-learning competency for enhancing educational competitiveness in higher education

In order for enhancing students-centered educational competitiveness in higher education, one of the key points depends on the level of life-learning competency of university students. Learning in higher education context takes place not only in formal learning in the classroom, but also in informal learning outside the classroom. Thus, the level of life-learning competency of university students may be a core variable that determines the quality of university education (Sung, 2017). For that reason, there is an important issue how to improve the life-learning competency of university students in higher education

The life-learning competency of university students can be regarded as the ability to acquire constantly changing knowledge and skills (Sung, Jin, Kim, 2016a). In short, Life-learning competency means the ability to continuously acquire unstructured or structured knowledge by understanding the flow of knowledge in a changing environment (Sung & Choi, 2016; Sung, Jin, Kim, 2016a).

Life-learning competency consists of 3 variables such as thinking skills, ability to use intellectual tools, and learning agility (Sung, Jin, Kim, 2016a; Sung, Jin, Kim,

2016b).

Thinking skills are competency to make decisions and inference, by looking at phenomena objectively or logotionally, based on critical thinking. Ability to use intellectual tools is competency to mutually using language, symbols, characters, and knowledge with information and technology. Meaning that an individual actively communicates with the world, induce changes for one's goals and able to use language, symbols, characters, knowledge, information and technology as tools to adapt to technological changes. Learning agility is competency to learn quickly through new situation or experience with intellectual curiosity.

One of the factors influencing life-learning competency in higher education is self-directed learning ability and problem-solving ability. Besides, it is possible to infer that life-learning competency may be related to academic achievement as the ultimate learning outcome

Self-directed learning ability with life-learning competency in higher education

One of the main features of university education is appeared the characteristics of adult education that learner is required self-directed learning (Knowls, 1975; Sung & Choi, 2016; Sung, Jin, Yoo, 2016). Knowls (1975) indicates that it occurs when the learner takes the responsibility for identifying learning needs, developing learning goals, preparing a learning plan, locating learning resources and implementing the plan, and evaluating the results and the process-essentially, directing his or her own life and learning.

Sung & Choi (2016) approaches the self-directed learning from the perspective of performance ability and interprets it as the concept of competency. They are conceptualized self-directed learning competency that is the ability to perform effectively and effectively to create excellent performance based on the learners' psychological and motivational characteristics, and knowledge, skills, and strategies

about learning methods. They also found that self-directed learning competency factors of university students are strategic learning skills, learning value and beliefs, learning flow, and inquisitive learning strategies. The self-directed learning competency factor that distinguishes the best learner from the university education is the learning value belief and learning flow (Sung & Choi, 2016).

Problem-solving ability with life-learning competency in higher education

Recently, Partnership for 21st Century Learning (Bellanca & Brandt, 2010) emphasizes learning and innovation skills that 21st century's learners should have competency and suggests problem solving ability as a major factor.

Problem solving ability refers to the ability to anticipate problems and prevent problems from occurring in advance, as well as to solve problems quickly. Also, Sung & Park (2012) indicate that problem-solving ability is the ability to set the goal to achieve, and to select the appropriate strategy in order for solving the problem by problem solving process. Problem solving requires that learners generates and try out solution in their minds (mental model or mental spaces) before trying them out in physical world and its context (Jonassen, 2004). Problem solving process consists of identifying problem cause, planning solution, implementing and evaluating the process and results (Lee, et al, 2003; Sung & Park, 2012).

Academic achievement with life-learning competency in higher education

It is easy to infer that life-learning competency of university students is highly related to academic achievement in higher education. Life-learning competency consists of thinking skills, ability to use intellectual tools, and learning agility that are closely related to academic achievement as learning outcomes. However, there is controversy about what factors of life-learning competency affect academic achievement in university students.

Research questions of this study

In order for enhancing students-centered educational competitiveness in higher education, the task of enhancing learners' learning abilities should be preceded by priority. In this case, it is necessary to closely examine how the life-learning competency of university students is related with their academic achievement as a self-directed learning ability, problem solving ability.

To address those goals, this study is to examine the relationships between life-learning competency and self-directed learning ability, problem-solving ability, and academic achievement. The research questions are as follows.

- 1) What is the level of life-learning competency, self-directed learning ability, problem-solving ability, and academic achievement of university students in higher education?
- 2) Is there a gender difference in university students on self-directed learning ability, problem-solving ability, and academic achievement?
- 3) Is life-learning competency of university students related to their self-directed learning ability, problem-solving ability, and academic achievement in higher education?

Method

Data collection

The present study used a data set from the Korean Youth Competency Measurement and International Comparative Study III: International Civic and Citizenship Survey (ICCS) 2016 were collected from undergraduate students (1 ~ 4th grade) nationwide in South Korea. In this research, a stratified clustered sample design was used on the sample group of randomly selected 680 undergraduate

students (343 males, 337 females) in South Korea. The mean age of participants was 23.33 years (SD=2.23).

Materials

The paper-based materials consisted of a participant questionnaire, life-learning competency questionnaire, self-directed learning questionnaire, problem-solving questionnaire. A participant questionnaire solicited demographic information concerning age, gender, year in university, and academic achievement as grade point average(GPA) in university.

Life-learning competency questionnaire was developed by Sung, Jin, & Kim (2016) consisted of 24 rating items such as thinking skills (6 items) (i.e. *When I am doing something, I can understand the relationship between the details of the task and the final goal*), intellectual tools using ability (12 items) (i.e. *When I read text, I find out author's intention while reading text*), and learning agility (6 items) (i.e. *When I study, I actively accept changes that occur around me*). The participants were asked to rate on a 4-point scale (with *strongly agree=4, agree=3, disagree=2, and strongly disagree=1*) the level of agreement with statements. The reliability coefficient obtained by Chronbach's alpha was .842, which indicates suitable reliability.

Self-directed learning questionnaire was developed by Sung & Choi (2016) consisted of 8 rating items such as strategical learning skills (2 items) (i.e.), inquiry learning strategy (2 items) (i.e. *I review what I learned on that day*), learning flow (2 items) (i.e. *While I and studying, I check out the next learning process*), and learning value and belief (2 items) (i. e. *I enjoy the process of studying rather than for grade*). The participants were asked to rate on a 4-point scale (with *strongly agree=4, agree=3, disagree=2, and strongly disagree=1*) the level of agreement with statements. The reliability coefficient obtained by Chronbach's alpha was .781, which indicates suitable reliability.

Problem-solving questionnaire was developed by Lee et al (2003) consisted of 6

rating items such as identify and casual analysis of problem (2 items) (i.e. *I think that a problem has a major cause and looks for its cause*), solution inquiring (2 items) (i.e. *I look for a solution to the problem in a different way than before*), and implication and reflection (2 items) (i.e. *I do not know the result, but I try to run it if it is possible*). The participants were asked to rate on a 4-point scale (with *strongly agree*=4, *agree*=3, *disagree*=2, and *strongly disagree*=1) the level of agreement with statements. The reliability coefficient obtained by Chronbach's alpha was .700, which indicates suitable reliability.

Data analysis

The collected data were analyzed with SPSS 18.0. The statistical techniques were employed an independent t-test, correlation analysis, and regression analysis.

Independent t-test was used in order to examine whether the respondents showed gender differences in life-learning competency, self-directed learning ability, problem-solving ability, and academic achievement in university students, including effect size of Cohen's *d* (Cohen, 1988). Also, correlation analysis was used to identify the strength of association within self-directed learning ability, problem-solving ability, and academic achievement on life-learning competency. Then finally, regression analysis was conducted to identify the relationship between life-learning competency and self-directed learning ability, problem-solving ability, and academic achievement.

Result

Descriptive statistics and gender differences on variables

To identify the relationships among variables, there was examined whether the university students differed in gender with life-learning competency, self-directed learning ability, problem-solving ability, and academic achievement in higher

education context. Table 1 shows not only the mean scores and standard deviations, but also the results of the t-test on gender differences including Cohen's effect size. As shown in Table 1, the mean total score of life-learning competency was 2.84(SD=.33), there was significant differences in gender on life-learning competency at the level of $p<.05$, $t=3.233$, effect size was $d=.24$. In short, Males in university students were significantly higher score of life-learning competency than

Table 1. Descriptive statistics and t-value of variables by gender differences

Variables	Gender	N	M	SD	T-value	d	
Life-learning competency	Total	Male	343	2.88	.34	3.233**	.24
		Female	337	2.80	.32		
		Total	680	2.84	.33		
	Thinking skills	Male	343	2.94	.38	-1.262	-
		Female	337	2.98	.33		
		Total	680	2.96	.35		
	Ability to use intellectual tools	Male	343	2.80	.46	3.350**	.24
		Female	337	2.69	.44		
		Total	680	2.75	.45		
	Learning agility	Male	343	2.98	.39	4.297**	.33
		Female	337	2.85	.40		
		Total	680	2.91	.40		
Self-directed learning ability	Male	343	2.72	.47	2.803**	.21	
	Female	337	2.62	.47			
	Total	680	2.67	.47			
Problem-solving ability	Male	343	2.98	.40	4.078**	.31	
	Female	337	2.86	.37			
	Total	680	2.92	.39			
Academic achievement	Male	335	3.5	.41	.472	-	
	Female	320	3.49	.38			
	Total	655	3.50	.40			

female. Especially, males scores of ability to use Intellectual tools ($t=3.350$, $p<.01$, $d=.24$) and learning agility ($t=4.297$, $p<.01$, $d=.33$) were significantly higher than female. However, there was no significant difference on thinking skills.

The mean score of self-directed learning ability was 2.67(SD=.47), there was significant differences in gender on self-directed learning ability at the level of $p<.05$, $t=2.803$, effect size was $d=.21$. In short, Males in university students were significantly higher score of self-directed learning ability than female.

The mean score of problem-solving ability was 2.92(SD=.30), there was significant differences in gender on problem-solving ability at the level of $p<.05$, $t=4.078$, effect size was $d=.31$. In short, Male in university students was significantly higher score of problem-solving ability than female.

The mean score of academic achievement was 3.50(SD=.40), there was non-significant differences in gender on problem-solving ability, $t=.472$.

Regression analysis of self-directed learning ability, problem-solving ability, and academic achievement on life-learning competency

The primary issue in this study was examined the relationships between life-learning competency and self-directed learning ability, problem-solving ability, and academic achievement of university students in higher education context. To address this goal, regression analysis was conducted that was life-learning competency, self-directed learning ability, problem-solving ability, and academic achievement on life-learning competency.

First of all, correlation coefficient was examined among the variables based on two-tailed tests with $p<.05$ in Table 2. There was a significant positive correlation among sub-variables of life-learning competency as independent variables at the level of $p<.05$, ranging from $r=.347$ to $r=.459$. Also, there was a significant positive correlation among all variables at the level of $p<.05$, ranging from $r=.095$ to $r=.601$.

Table 2. Correlation among variables

Variables	①	②	③	④	⑤	⑥	⑦
① Total	-						
Life-learning competency							
② Thinking skills	.611**	-					
③ Ability to use intellectual tools	.914**	.347**	-				
④ Learning agility	.709**	.356**	.459**	-			
⑤ Self-directed learning ability	.555**	.390**	.447**	.486**	-		
⑥ Problem-solving ability	.582**	.433**	.419**	.601**	.526**	-	
⑦ Academic achievement	.141**	.135**	.119**	.077*	.182**	.095*	-

** : $p < 0.01$, * : $p < 0.05$

For the further examination, the relationships between life-learning competency and self-directed learning ability, problem-solving ability, and academic achievement were examined. Table 3 shows result of regression analysis among variables. As show in Table 3, regression model of life-learning competency on self-directed learning ability was significant, $F=302.087$, $p < .01$, $R^2=.308$, adj. $R^2=.307$. Life-learning competency was significantly positive predictor variables on self-directed learning ability, $\beta=.555$, $t=17.381$, $p < .01$. In sub-variables of life-learning competency, thinking skills ($\beta=.199$, $t=5.761$, $p < .01$), ability to use intellectual tools ($\beta=.237$, $t=6.520$, $p < .01$), and learning agility ($\beta=.307$, $t=8.431$, $p < .01$) were significantly positive predictor variables on self-directed learning ability, $F=112.204$, $p < .01$, $R^2=.332$, adj. $R^2=.329$.

Regression model of life-learning competency on problem-solving ability was significant, $F=347.578$, $p < .01$, $R^2=.339$, adj. $R^2=.338$. Life-learning competency was significantly positive predictor variables on problem-solving ability, $\beta=.582$, $t=18.643$, $p < .01$. In sub-variables of life-learning competency, thinking skills ($\beta=.224$, $t=7.004$, $p < .01$), ability to use intellectual tools ($\beta=.129$, $t=3.854$, $p < .01$), and learning agility ($\beta=.462$, $t=13.698$, $p < .01$) were significantly positive predictor variables on problem-solving ability, $F=168.734$, $p < .01$, $R^2=.428$, adj. $R^2=.426$.

Regression model of life-learning competency on academic achievement was significant, $F=13.272$, $p<.01$, $R^2=.020$, adj. $R^2=.018$. Life-learning competency was significantly positive predictor variables on academic achievement, $\beta=.141$, $t=3.643$, $p<.01$. In sub-variables of life-learning competency, regression model was significant, $F=112.204$, $p<.01$, $R^2=.332$, adj. $R^2=.329$. Thinking skills ($\beta=.106$, $t=2.501$, $p<.01$) was significantly positive predictor variables on problem-solving ability, $F=5.392$, $p<.01$, $R^2=.024$, adj. $R^2=.020$. There was non-significant regression on ability to use intellectual tools and learning agility in academic achievement.

Table 3. Regression models of self-directed learning ability, problem-solving ability, and academic achievement on the life-learning competency of university students

Dependent variable	Life-learning competency	R^2 (adj. R^2)	F	B	β	t
Self-directed learning ability	Total	.308 (.307)	302.087**	.796	.555	17.381**
	Thinking skills			.267	.199	5.761**
	Ability to use intellectual tools	.332 (.329)	112.204**	.248	.237	6.520**
	Learning agility			.366	.307	8.431**
Problem-solving ability	Total	.339 (.338)	347.578**	.683	.582	18.643
	Thinking skills			.246	.224	7.004**
	Ability to use intellectual tools	.428 (.426)	168.734**	.111	.129	3.854**
	Learning agility			.450	.462	13.698**
Academic achievement	Total	.020 (.018)	13.272**	.170	.141	3.643**
	Thinking skills			.119	.106	2.501**
	Ability to use intellectual tools	.024 (.020)	5.392**	.072	.081	1.823
	Learning agility			.004	.004	.094

** : $p<0.01$, * : $p<0.05$

Conclusion

The purpose of this study was to examine whether respondents showed gender differences in life-learning competency, self-directed learning ability, problem-solving ability, and academic achievement and to identify relationships among variables of university students in higher education. As results, statistically significant difference was showed in the participants' gender that male university students were higher score than female university students in life-learning competency, self-directed learning ability, and problem-solving ability except academic achievement. In in life-learning competency, especially, ability to use intellectual tools and learning agility were shown significant differences except thinking skills. Meanwhile, sub-variables of life-learning competency were positively related to self-directed learning ability and problem-solving. However, thinking skills in life-learning competency was only positively related to academic achievement in university students in higher education. Based on the results of this study, some interpretation was suggested the following.

Gender differences in the life-learning competency of university students may be the result of the combination of gender traits and characteristics of the university environment. Learning context in higher education takes place not only in formal learning in the classroom, but also in informal learning outside the classroom. Thus, university students are required not only to acquire formal knowledge but also to take flexible knowledge actively according to the change of society.

Learning in this learning environment is more advantageous for learners with more challenging and enterprising tendencies. These results may be attributed to the characteristics of man seeking to challenge in a new learning situation or environment rather than the characteristics of women seeking stability in higher education context. This interpretation can be inferred from the results of regression analysis that score of learning agility of man is significantly higher than woman's one. In short, it may be interpreted that the gender differences in the learning

ability can be interpreted because the characteristics of man who want to learn quickly through new situations or experiences with intellectual curiosity are stronger than women. However, academic achievement at the university is required for a different interpretation. There was shown no significant gender differences and related only thinking skills.

Current academic achievement of university may be the result of learning that requires only cognitive thinking ability set in the curriculum. This means that the current university credit is a learning environment that does not need creative thinking skills. If so, it can be difficult to reach the goal of securing educational competitiveness and improving the quality of education in university education. This is because it shows that the learning process and the evaluation of learning in university education are not done properly. Therefore, innovative efforts for teaching and learning methods and evaluation for enhancing competitiveness of university education are required.

In addition, in order for university education to be more competitive in education, it is necessary to have an educational system to train talented people with actual performance competency, rather than those who know formal knowledge. It is encouraging that the university's efforts to transform into competency-centered education and build a competency-based curriculum, instructional method, and evaluation. However, efforts to improve the quality of learning process and learning experience of university students should be strengthened beyond the surface structure.

In the future, it is noteworthy that what kind of talented student in university will be cultivated through university education that has been transformed into competency-centered curriculum. To this end, efforts for continuous education reform are expected to proceed.

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Eunmo SUNG

Ph.D. in Educational Technology, Seoul National University.

Associate Research Fellow, National Youth Policy Institute.

Interests: Instructional System Design, Learning Design, Self-Directed Learning, Competency based Learning, Learning Analytics, Technology Integration for Learning

E-mail: emsung@nypi.re.kr