

Factors Related to Technological Pedagogical Content Knowledge(TPACK) of College Instructors: Focusing on the Epistemological Beliefs and the Social Support

Mi-Seok Yang^{*}, Young-Sun Cho^{**}, Ji-Suk Kim^{***}
Chungnam National University^{*}, Mokwon University^{**}, Baekseok University^{***}

대학 교수자의 테크놀로지 내용교수지식(TPACK) 관련 요인: 인식론적 신념과 사회적 지지를 중심으로

양미석^{*}, 조영선^{**}, 김지숙^{***}
충남대학교^{*}, 목원대학교^{**}, 백석대학교^{***}

Abstract Rapid growth of information and communication technology and changes in college student characteristics require for university instructors to diversify instructional improvement efforts. Technological Pedagogical Content Knowledge (TPACK) is a capacity that instructors need to build for making instructional design based on consolidated technology. Accordingly this study explores instructors' awareness of the importance and performance of TPACK and to inquire into their relationships with epistemological beliefs and social support as relevant factors through a survey carried out with 264 instructors. The study has shown that there is a significant difference between college instructors' awareness of the importance of TPACK and their awareness of its performance. Furthermore, it has shown that the awareness of importance and performance of TPACK is significantly related to the social support, and that among the sub-factors of the social support, significant influences are observed from the emotional support on their awareness of the importance of TPACK and from the informational support on their awareness of the performance of TPACK. These results provide fundamental data for measures to develop and support TPACK capacity of college instructors, suggesting that it requires a teaching support strategy to enhance social support for instructors above all things.

Key Words : College education, Technological Pedagogical Content Knowledge, TPACK, Epistemological beliefs, Social support

요 약 급속한 정보통신기술의 발달과 대학 학습자의 특성 변화에 따라 대학 교수자의 다양한 수업개선 노력이 요구되고 있다. 테크놀로지 내용교수지식(Technological Pedagogical Content Knowledge, TPACK)은 통합 테크놀로지 기반의 수업설계를 위해 교수자가 갖추어야 할 역량이라 할 수 있다. 이에 본 연구에서는 TPACK의 중요도와 실행도에 관한 대학 교수자의 인식을 알아보고, 이와 관련된 변인으로 인식론적 신념, 사회적 지지와의 관계를 규명하기 위해 264명의 교수자에게 설문조사를 실시하였다. 연구결과에 따르면 대학 교수자의 TPACK 중요도와 실행도 인식 간에 유의한 차이가 있는 것으로 나타났다. 또한 TPACK 중요도와 실행도 인식과 사회적 지지 간에 유의한 상관관계 있는 것으로 나타났으며, 사회적 지지 하위요인 중에서 정서적 지지는 TPACK 중요도 인식에, 정보적 지지는 TPACK 실행도 인식에 유의한 영향을 미치는 것으로 나타났다. 이러한 결과는 대학 교수자의 TPACK 역량 개발 및 지원을 위한 방안 수립에 기초자료를 제공하는 것으로, 무엇보다도 교수자의 사회적 지지 향상을 위한 교수지원 전략이 요구된다고 할 수 있다.

주제어 : 대학교육, 테크놀로지 내용교수지식, TPACK, 인식론적 신념, 사회적 지지

Received 25 August 2016, Revised 4 October 2016
Accepted 20 November 2016, Published 28 November 2016
Corresponding Author: Ji-Suk Kim(Baekseok University)
Email: jiskim@bu.ac.kr

© The Society of Digital Policy & Management. All rights reserved. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ISSN: 1738-1916

1. Introduction

1.1 Background and purpose

The more information and communication technology develops and the more diverse digital devices are generalized, the more technology becomes diversified and easily accessible. People are required to acquire quickly and search new knowledge and information through these digital devices. It requires a new set of capacities to acquire and elicit active and creative knowledge rather than to be just passive learners. College instructors are to build up the talents required in future society but they cannot provide their students with all the necessary knowledge, so that they have to be a promoter who can receive effective information and create new knowledge[1]. The instructors are needed not only to be keen on new knowledge or digital devices that would maximize the effects of teaching and class but also to make good use of them positively.

Instructors' intellectual ability to plan and conduct a class using technology is called Technological Pedagogical Content Knowledge (TPACK)[2] and it indicates that they need to embrace content knowledge, teaching and learning knowledge, and knowledge of technology. TPACK is a necessary ability for instructors who want to teach with technology[3]. Being well-acquainted with using technology in teaching context and utilizing it in real classroom are imperative for the instructors.

Nowadays instructors, however, possess the contents based on their own specialties without educational knowledge and learning experience; they merely have an opportunity to enhance and strengthen their teaching ability due to lack of educational knowledge[4]. Instructors' specialized knowledge and enhancement of the teaching ability are practical effectors on college students. An environmental change that now colleges should foster talented students to obtain indispensable capacities required in the 21st century calls for behavioral actions founded on the objectives and evolutions of the teaching method as

required in actual education fields.

College instructors' abilities can be acquired from epistemological beliefs, instructors' own belief on the essence about knowledge and life, and instructors' perspective on knowledge, based on the knowledge of their own classes and the knowledge such as content knowledge, teaching knowledge, knowledge of teaching method and evaluation, and knowledge of class situation[5]. Instructors' own belief would be knowledge and teaching belief about content under technological pedagogical content knowledge, pedagogy, and basis upon which good teaching with technology is conducted. This epistemological belief includes conceptual understanding, teaching method using technology in its architectural method, and teaching knowledge using technology for students to understand easily in class[6].

College instructors stated that they can change and enhance educational quality-related environmental factors by satisfying their own business when they are supported socially in their own systematic educational circumstances[7]. Also, through a variety of social supports, instructors could be provided with emotional stability and assistances and thereby enhance their teaching ability. College instructors need to be supported and cheered in their hardships under educational circumstances to execute and utilize their own technology pedagogical contents knowledge. In their organization, attention and support from colleagues who are able to promote their business independently or cooperatively, close relationship amongst instructors would play an important role in enhancing teaching ability[8,9].

According to previous domestic studies, researches on TPACK of college instructors are covering awareness of importance and performance[4]. A study was conducted focusing on awareness and utilization of teacher/instructor candidates in charge of the most general subjects[3,5] while research on TPACK of college instructors is still insufficient. Accordingly it needs to explore how the college teachers' beliefs in

knowledge and study affect their awareness of TPACK and how the social support among the environmental elements of teachers influences on TPACK.

This study focuses on college instructors' awareness about importance and performance of TPACK and examine its relations with epistemological beliefs and social support as specialized factors of instructors that would affect the awareness.

1.2 Research Questions

This study suggests the following research questions.

First, how is the awareness of college instructors about importance and performance of TPACK?

Second, how does the relationship between the awareness of importance and performance of TPACK and epistemological beliefs and social support as related factors?

Third, how is the awareness of importance and performance of TPACK affected by epistemological beliefs and social support as related factors?

2. Theoretical Background

2.1 Technology, Pedagogy, and Content, Knowledge (TPACK)

Technology, pedagogy, and content, knowledge is a new way to access to necessary knowledge when a professor conducts a lecture, and it originates from Pedagogical Content Knowledge (PCK) that is an intersection of Content Knowledge (CK) and Pedagogical Knowledge (PK) as a knowledge on pedagogy and teaching. Subsequently, it is emphasized to utilize technology along information and communication technology development so that the concept of TPACK is developed and extended as a concept mixture of technology and PCK.

TPACK means knowledge emphasizing organic inter-relationship among technology, pedagogy, and content. It is a combined knowledge of ways to teach

students some difficult lecture effectively by teaching applied with technology[1]. TPACK, as a way to devise and execute technology-applied class, is an essential ability for instructors[3].

According to previous studies, it is proved that there is significant difference between awareness of importance and of performance in TPACK ability of teacher/instructor candidates[10]. Class devising experiences, based on team project and ASSURE model, for enhancing TPACK ability for preliminary mathematics teacher were proved effective by previous studies[3,5]. Also, while technology knowledge and pedagogical knowledge, under the relationship between solid belief on technology utilization ability and perceived TPACK, affect TPACK, content knowledge and solid belief are reported as not to affect significantly under the circumstance of pedagogy for preliminary primary school teachers[11]. As a result of analysis on ability about TPACK of college instructors, significant differences have been noticed in 7 areas and 23 sub-areas between ability importance and ability performance[4].

Recent researches on TPACK have been conducted regarding utilization of TPACK over certain subjects and examine the awareness of importance and that of performance. Thus, this study diagnoses the fundamental awareness of college instructors about importance and performance of TPACK and investigate how the awareness are correlated with epistemological beliefs, beliefs of knowledge and teaching of college instructors, and social support.

2.2 Epistemological Beliefs

The term 'epistemological beliefs', a compound word of epistemology and belief, has two conceptual characteristics, namely, a personal belief on nature of knowledge or process of knowing and a learner's own belief on essence of knowledge and learning[12].

Epistemological beliefs, while implying domain-specificity, do not impose to form knowledge to a

certain direction, but become a resource to drive knowledge to various directions in the context[13,14]. Epistemological beliefs usually suggest that a nature and access of knowledge have evolved from a view that absolute and objective knowledge should be taught by external experts into another view that uncertain and relative knowledge should be formed by cognitive subject from diverse sources[15].

The contents of the previous studies are as below: as a result of the study on relationships among epistemological beliefs, pedagogy, and educational concept of teacher/instructor candidates, it has shown that they regard the teaching efforts as more important than gifted abilities and the knowledge as changeable. And it has shown that they do not believe in knowledge from experts but tend to regard the knowledge acquired by themselves as more empirical and reliable[16]. Meanwhile, a study [17] suggested that pedagogical strategy will vary with the beliefs on knowledge and teaching of teachers; teaching actions of teachers reflect their beliefs on knowledge and teaching. Teaching actions differ when they believe effort and process are important to learn knowledge and when they believe that human ability is born and fixed. The pedagogical acting and executing educational process used by instructors would be different with instructors' epistemological beliefs. A previous study [12], conducting observations and interviews on two college chemistry lectures that had emphasized different epistemological beliefs, reported that students' cognition on class circumstance originates from their epistemological beliefs and, at the same time, the professor and the circumstance are related significantly. A study on the change of epistemological beliefs in pedagogical circumstances of teacher/instructor candidates, has shown that since a class design could change epistemological beliefs, certain pedagogical circumstances would affect and change beliefs of teacher/instructor candidates[18].

Thus, this study will find out how the importance

and performance of TPACK and a pedagogical ability, are interrelated with epistemological beliefs that are linked to pedagogical methods and acts of college instructors.

2.3 Social Support

Social support develops through relationships with others in one's whole life and affects personal psychologic development positively[19]. A positive social support experience makes one feel being loved, accepted, and relaxed so as to prevent disorders when facing stressful situations. Also, the support helps one enhance self-efficacy and coping strategy[20].

Studies on social support since 1970s have covered the influence that a stress affects adaptation[21]. Social support refers to all positive resources one can attain from interpersonal relationships[22]. Social support helps one feel calm and address a problem, provides others advices and material support with service, and makes feel oneself as a part of social network[23].

Social support can be classified into emotional support, informational support, and evaluative support. Emotional support from social network is reportedly reinforcing adaptability to circumstances ultimately by providing a person with psychological ease and by alleviating negative effects caused by his or her psychological and physiological experiences under stressful situations[24]. Informational support is to provide knowledge or information to smoothly solve problems arising from a person or circumstance, and evaluative support is to feed solid evaluative information on one's role performance and behavior. Thus, it would be devoted as a positive resource to adapt pedagogical learning psychologically and overcome problem frustration in pedagogical method and its executing within the social support circumstance of college instructors[22].

This study will find out how social support for college professor is related to importance and performance of TPACK and pedagogical ability.

3. Methodology

3.1 Objects

This study carried out surveys with 264 instructors from 3 universities located in Daejeon and Chungnam regions. Among them, two universities are 4-year colleges and the other is a junior college. General background variables of the objects are showed in the following <Table 1>.

<Table 1> General Background Variables

	item	quantity	percentage
college	4-year college	192	72.7
	junior college	72	27.3
	total	264	100.0
age group	30s	43	16.3
	40s	122	46.2
	50s	88	33.3
	60s	11	4.2
	total	264	100.0
major group	language and literature	29	11.0
	humanitiess and society	81	30.7
	educational science	14	5.3
	science and engineering	22	8.3
	medicine and health	65	24.6
	art, music and physical education	44	16.7
	non-response	9	3.4
	total	264	100.0
position	professor	27	10.2
	associate professor	60	22.7
	assistant professor	121	45.8
	instructor	28	10.6
	part-time lecturer	26	9.8
	adjunct professor	2	.8
	total	264	100.0

3.2 Measures

In this study, survey from a previous study [4] is used to measure awareness on TPACK importance and performance. The survey contains 32 questions; four questions are about general background variables and 28 questions (7 areas and 28 sub - factors) are covering instructors' ability on TPACK. Gathered data is analyzed with answered importance level and answered performance level to each question, using 5-point Likert scale. The reliability coefficient of TPACK

importance and reliability measure (Cronbach α) was reported to be as very high as .979.

A survey from a previous study [25] is used to measure epistemological beliefs. The survey questions are classified into 4 dimensions: certainty of knowledge, knowledge from experts/professionals, gifted/fixed ability, and learning effort/process. Each measuring question is made up with 5-point Likert scale from 'strongly disagree' to 'strongly agree.' Certainty of knowledge is a belief that knowledge is fixed with no changes. five questions out of all survey questions - no. 2, 9, 13, 17, and 19 - are relevant to this. Knowledge from experts/professionals is whether to believe that the knowledge is passed on by authorized experts. Six questions out of all survey questions - no. 1, 8, 12, 22, 27, and 30 - are relevant to this. Gifted/fixed ability is whether to believe that human ability is endowed with birth and never changes. Eight questions out of all survey questions - no. 4, 7, 11, 14, 16, 21, 25, and 28 - are relevant to this. Learning effort/process is whether to believe that a person can try to acquire knowledge during process of learning where the process is important. 11 questions out of all survey questions - no. 3, 5, 6, 10, 15, 18, 20, 23, 24, 26, and 29 - are relevant to this. The result of the analysis on reliability coefficient (Cronbach α) of epistemological beliefs measure was .722 that is quite high.

A survey from a previous study [26] is used to measure awareness about social support. The survey questions are classified into three dimensions: emotional support, evaluative support, and informational support. And each measuring question is made up with 5-point Likert scale from 'strongly disagree' to 'strongly agree.' Emotional support is measured with 7 questions - no. 1 to 7 - about some behaviors, that satisfy people's basic social and emotional desires, and these behaviors are loving, understanding, sense of closeness, encouragement, reliability, interest, and empathic listening. Evaluative support is measured with six questions - no. 8 to 13 - about some behaviors, that

are related to evaluations such as acknowledgement or denial of one's performance, and those behaviors are compliment, acknowledgement of one's talents, respect of one's personality, fair evaluation, encouragement of one's value, and respect of one's opinion. Informational support is measured with six questions - no. 14 to 19 - about information that he or she can use when facing problems under the situations of problem solving, decision making, adaptation and trouble. The questions lead to choose one of the behaviors such as advice, counsel, instruction, or providing knowledge on society. The result of the analysis with reliability coefficient (Cronbach α) of social support measure was as very high as .957.

4. Result and Discussion

4.1 Analyzed Results of Technical Statistics

According to the result of this study, college instructors' awareness for sub-factors of TPACK importance and performance are shown in the following <Table 2>. First, in $p < .001$ level, there is significant differences among awareness of TK, CK, PK, PCK, TCK, and TPK importance and performance except for TPACK, based on average importance and performance for sub-factors of TPACK.

<Table 2> Technical statistics of TPACK sub-factors

item		N	M	SD	t
TK	importance	253	3.52	0.74	6.935***
	performance	253	3.20	0.73	
CK	importance	255	4.14	0.83	4.149***
	performance	255	3.98	0.79	
PK	importance	254	4.16	0.72	6.570***
	performance	254	3.95	0.70	
PCK	importance	257	4.12	0.85	5.635***
	performance	257	3.86	0.84	
TCK	importance	257	3.99	0.92	5.579***
	performance	257	3.72	0.89	
TPK	importance	254	3.88	0.78	6.270***
	performance	254	3.64	0.73	
TPACK	importance	258	3.71	0.93	.457
	performance	258	3.69	0.90	

*** $p < .001$

Second, a close look at average data of sub-factors of epistemological beliefs reveals cognition of learning effort/process being rated 3.97 which is higher than other sub-factors.

<Table 3> Technical statistics of epistemological beliefs sub-factors

item	N	M	SD
certainty of knowledge	260	3.01	0.53
knowledge from experts/professors	259	2.69	0.47
gifted/fixed ability	258	2.67	0.57
learning effort/process	258	3.97	0.48

Third, a close look at average data of sub-factors of social support reveals 'emotional support' being rated 4.19 which is higher than other sub-factors. Particularly emotional support and informational support are rated much higher than evaluative support.

<Table 4> Technical statistics of social support sub-factors

item	N	M	SD
emotional support	261	4.19	0.56
evaluative support	261	2.92	0.34
informational support	260	4.15	0.51

4.2 Awareness of TPACK Importance-Performance

In this study, a formula from a previous study [27] is used to measure needs for change of awareness about TPACK importance-performance of college instructors. Need for change index and order of priority emerged by the formula is shown in the following <Table 5>. According to this research, a sub-factor with high awareness of needs for change is TK; subsequently TCK, PCK, TPK, PK, CK, and TPACK followed.

<Table 5> college instructors' awareness of TPACK Importance-Performance (n=264)

TPACK factor	awareness of importance (A)	awareness of performance (B)	A-B	needs for change	
				index	order
TK	3.52	3.20	0.32	1.13	1
CK	4.14	3.98	0.16	0.66	6
PK	4.16	3.95	0.21	0.87	5
PCK	4.12	3.86	0.26	1.07	3
TCK	3.99	3.72	0.27	1.08	2
TPK	3.88	3.64	0.24	0.93	4
TPACK	3.71	3.69	0.02	0.07	7

4.3 Awareness of TPACK' s Correlations Between Epistemological Beliefs and Social Support

In this study, in order to measure factors related to awareness about TPACK of college instructors, a correlation between epistemological beliefs and social support is examined. Firstly, correlations of importance with sub-factors of TPACK and epistemological beliefs/social support are shown in the following <Table 6>. According to this research, in a level $p < .01$, it reveals that a significant correlation between TPACK sub-factors and social support. On the other hand, except for that a significant correlation is observed between epistemological beliefs and awareness of CK importance in a level $p < .05$, other factors do not show a significant correlation.

<Table 6> Correlations between importance of TPACK sub-factors and epistemological beliefs(e.b.)/social support(s.s.)

item	1	2	3	4	5	6	7	8	9
TK	1								
CK	.549**	1							
PK	.547**	.804**	1						
PCK	.483**	.748**	.788**	1					
TCK	.637**	.703**	.716**	.748**	1				
TPK	.649**	.714**	.748**	.738**	.817**	1			
TPACK	.503**	.479**	.567**	.516**	.609**	.667**	1		
e.b.	.057	.131*	.047	.080	.047	.002	.026	1	
s.s.	.206**	.249**	.350**	.298**	.251**	.326**	.352**	-.124	1

** $p < .01$, * $p < .05$

Secondly, <Table 7> shows correlations between performance of TPACK sub-factors and epistemological beliefs/social support. According to this study, it reveals that there is a significant correlation between TPACK sub-factors and social support with a level $p < .01$. Otherwise, there is no significant correlation between epistemological beliefs and other factors.

<Table 7> Correlations between performance of TPACK sub-factors and epistemological beliefs(e.b.)/social support(s.s.)

item	1	2	3	4	5	6	7	8	9
TK	1								
CK	.353**	1							
PK	.385**	.758**	1						
PCK	.280**	.674**	.743**	1					
TCK	.495**	.590**	.655**	.695**	1				
TPK	.534**	.625**	.672**	.712**	.794**	1			
TPACK	.466**	.540**	.566**	.596**	.693**	.826**	1		
e.b.	.040	.069	.032	.005	.056	.051	.039	1	
s.s.	.259**	.357**	.441**	.368**	.322**	.359**	.282**	-.124	1

** $p < .01$

4.4 Influences upon TPACK Importance and Performance by Epistemological Beliefs /Social Support

This study examined influences by epistemological beliefs and social support to find out factors related to awareness about TPACK of college instructors. Firstly, the result of regression analysis to investigate the influences to awareness of TPACK importance by sub-factors of epistemological beliefs of college instructors, is shown in the following <Table 8>. An explanatory power of epistemological beliefs about awareness of TPACK importance of college instructors is revealed as being 10.1%. Meanwhile, learning effort/process factor, among sub-factors of epistemological beliefs, affects the awareness of TPACK importance significantly and positively ($F = 6.603$, $p < .001$).

<Table 8> Influences upon TPACK importance by sub-factors of epistemological beliefs

Independent variables	Non-standardized coefficients		B	T
	B	Standard error		
certainty of knowledge	.112	.091	.083	1.226
knowledge from experts/professionals	.058	.096	.039	.599
gifted/fixed ability	-.042	.078	-.035	-.541
learning effort/process	.407	.095	.279	4.260**
R=.318, R ² (adj.R ²)=.101(.086), F=6.603***				

n=264, ***p<.001

Secondly, the result of regression analysis to find out the influences upon awareness of TPACK performance by sub-factors of epistemological beliefs of college instructors, is shown in the following <Table 9>. An explanatory power of epistemological beliefs about awareness of TPACK performance of college instructors is revealed as being 8.5%. Meanwhile, learning effort/process factor, among sub factors of epistemological beliefs, affects the awareness of TPACK performance significantly and positively (F=5.430, p<.001).

<Table 9> Influences upon TPACK performance by sub-factors of epistemological beliefs

Independent variables	Non-standardized coefficients		B	T
	B	Standard error		
certainty of knowledge	.081	.085	.066	.955
knowledge from experts/professionals	-.004	.091	-.003	-.048
gifted/fixed ability	-.003	.072	-.003	-.043
learning effort/process	.359	.089	.267	4.038***
R=.291, R ² (adj.R ²)=.085(.069), F=5.430***				

n=264, ***p<.001

Thirdly, the result of regression analysis to find out the influences upon awareness of TPACK importance by sub-factors of social support of college instructors, is shown in the following <Table 10>. An explanatory power of social support about awareness of TPACK importance of college instructors is revealed as being

12.6%. Meanwhile, emotional support factor, among sub-factors of social support, affects the awareness of TPACK importance significantly and positively (F=11.644, p<.001).

<Table 10> Influences upon TPACK importance by sub-factors of social support

Independent variables	Non-standardized coefficients		B	T
	B	Standard error		
emotional support	.401	.123	.321	3.248***
evaluative support	.176	.126	.085	1.403
informational support	.021	.131	.016	.161
R=.355, R ² (adj.R ²)=.126(.115), F=11.644***				

n=264, ***p<.001

Lastly, the result of regression analysis to find out the influences upon awareness of TPACK performance by sub-factors of social support of college instructors, is shown in the following <Table 11>. An explanatory power of social support about awareness of TPACK performance of college instructors is revealed as being 18.7%. Meanwhile, informational support factor, among sub-factors of social support, affects the awareness of TPACK performance significantly and positively (F=18.571, p<.001).

<Table 11> Influences upon TPACK performance by sub-factors of social support

Independent variables	Non-standardized coefficients		B	T
	B	Standard error		
emotional support	.124	.113	.107	1.098
evaluative support	.062	.114	.032	.546
informational support	.423	.121	.337	3.481***
R=.433, R ² (adj.R ²)=.187(.177), F=18.571***				

n=264, ***p<.001

5. Conclusion and proposal

According to the rapid development of information technology and the change of college learners' characteristics, various curriculum innovation efforts are required for college instructors. Following this

tendency, this research looks into the instructors' awareness of TPACK and proves the relationship between epistemological beliefs and social support with finding factors related to the perceptions.

The conclusion according to the results of this research are : first, regarding the individual importance of TPACK sub-factors and the average performance level, it has found that there is a significant difference between the importance and performance of TK, CK, PK, PCK, TCK, TPK. Furthermore, the sub-factor with the highest level of awareness about the need of change was TK, followed consecutively by TCK, PCK, TPK, PK, CK and TPACK. Such results reflect the recent college education trends which emphasize not only the professionalism of the instructors but also the teaching ability and media utilizing ability[28,29,30,31]. Therefore, a consistent instructional support is required due to their awareness of the need of change.

Second, a positive relationship was found between TPACK sub-factors and social support. However, epistemological beliefs had no significant relations with sub-factors other than CK importance awareness. Such results imply that in supporting the enhancement of college instructor's TPACK capabilities, there is a need to consider social support capabilities of both students and fellow instructors. Also, the relationships between the performance levels of individual TPACK sub-factors and epistemological beliefs and social support show a significant relations between TPACK sub-factors and social support. On the other hand, no significant relation was found between epistemological beliefs and other factors. This results, as mentioned above, suggest that consistent efforts to enhance social support capabilities and TPACK performance levels are imperative[32,33].

Lastly, regarding the effects of the instructor's epistemological beliefs and social support on TPACK importance and performance awareness, among the sub-factors of epistemological beliefs, learning effort/process appeared to affect TPACK importance

and performance level. And among the sub-factors of social support, emotional support affected TPACK importance awareness and informational support affected TPACK performance awareness.

This implies that in order to offer integrated media utilization support to university instructors, various contents must be provided to change the stereotypes on knowledge and it requires efforts so as to intensify programs that enhance social support techniques[34,35]. And assistances are required for systematic study to develop a deeper learning of instructors and their sustaining growth competency needed as being experts [36].

Proposals for future researches are: first, various program practicing researches are to be done to enhance TPACK capabilities. This does not call for the physical combination of class curriculum, technology and instructional methods, but the systematically integrated design fit to a variety of fields of studies. Second, diversified field application researches are to be done to enhance TPACK capabilities. For this, training programs should be prepared for teacher/instructor candidates in charge of elementary/middle school education, lifelong education and corporate training. Third, it requires researches on the learners' performance applied with instructor factors and TPACK-based instructional design factors.

REFERENCES

- [1] Y. H. So, "Development and Validation of Technology, Pedagogy, and Content Knowledge(TPACK)' Scale for elementary school teachers", Applied The Education Research Institute, Vol. 11, No. 1, pp.157-175, 2013.
- [2] P. Mishra & M. J. Koehler, "Technological Pedagogical Content Knowledge: A new framework for teacher knowledge", Applied Teachers College Record, Vol. 108, No. 6, pp.1017-1054, 2006.
- [3] H. M. Lim, & I. S. Choi, "A Case study on the effect of designing instruction according to the ASSURE model to mathematics teacher's TPACK and teaching

- efficacy”, *Applied The Journal of Educational Research in Mathematics*, Vol. 22, No. 2, pp.179-202, 2012.
- [4] M. R. Eom, “A Suggestion on Teaching Support Program through the Competencies analysis of University Faculties’ Technology, Pedagogy, and Content Knowledge(TPACK)”, *Applied Theory and Practice of Education*, Vol. 17, No. 3, pp.21-45, 2012.
- [5] H. M. Lim, “Study on the Effectiveness of Team Project to Improve TPACK of Preservice Mathematics Teachers”, *Applied The Journal of Educational Research in Mathematics*, Vol. 19, No. 4, pp.545-564, 2009.
- [6] L. S. Shulman, “Those who understand: Knowledge growth in teaching”, *Applied Educational Researcher*, Vol. 15, No. 2, pp.4-14., 1986.
- [7] J. H. Lim, & D. Y. Lee, “A study on the association between job satisfaction and social support among school teachers: Focusing on the structural equation models”, *Applied Journal of Vocational Rehabilitation*, Vol. 20, No. 1, pp.277-297, 2010.
- [8] O. G. Sin, “Relationship between job stress and social support of elementary school teachers”, Hongik Press, 2000.
- [9] W. C. Lee, “Relationships and values and job satisfaction of teachers”, SoGang University Press, 1994.
- [10] M. R. Eom, W. S. Shin, & I. S. Han, “A Survey on the Differences of Pre-service Teachers’ Perception of the Technology, Pedagogy, and Content Knowledge (TPACK)”, *Applied The Journal of Korean Teacher Education*, Vol. 28, No. 4, pp.141-165, 2011.
- [11] T. S. Shin, “A Relation between Pre-Service Teachers’ Fixed Mindsets Regarding their Abilities to Teach with Technology and their Perceived TPACK”, *Applied Journal of Educational Studies*, Vol. 44, No. 2, pp.21-45, 2013.
- [12] B. K. Hofer, “Epistemological understanding as a metacognitive process: Thinking aloud during online searching”, *Applied Educational Psychologist*, Vol. 39, pp.43-55, 2004.
- [13] K. Sormunen, “Form epistemological constraints towards epistemological in the science classroom”, *Applied Merrill-palmer Quarterly*, Vol. 35, pp.115-130, 2008.
- [14] C. H. Yoon, “Students’ Epistemological Beliefs: Theoretical Issues and Pedagogical Implications”, *Applied The Korean Journal of Educational Psychology*, Vol. 26, No. 1, pp.327-351, 2012.
- [15] S. A. Oh, & S. D. Lee, “The Effects of Pre-service Teachers’ Epistemological Beliefs and Self Regulated Learning on well-structured and ill-structured Problem Solving”, *Applied The Journal of Korean Teacher Education*, Vol. 30, No. 3, pp.75-99, 2013.
- [16] Cheng, Chan, Tang & Cheng, “Pre-service teacher education students’ epistemological beliefs and their conceptions of teaching”, *Applied Teaching and Teacher education*, Vol. 25, pp.319-327, 2009.
- [17] Y. J. Cho & M. H. Yang, “Secondary School Teachers’ Epistemological Beliefs and Their Relationship with Teacher Efficacy and Instructional Strategies”, *The Korean Society for The Study of Teacher Education*, Vol. 10, pp.1-12, 2007.
- [18] Gill, Ashton, & Algina, “Changing preservice teachers epistemological beliefs about teaching and learning in mathematics: An intervention study”, *Applied Contemporary Educational Psychology*, Vol. 29, No. 2, pp.95-102, 2004.
- [19] H. K. Lee, “A Study on the Relationship among Social support, Empowerment, and Psychosocial adjustment of children in Community Child Center”, Sookmyung Women’s University Press, 2007.
- [20] M. Barrera, “Social Support in the Adjustment of Preadolescent: Assesment Issues. In B. H. Gottlieb(Ed.). *Social Networks and Social Support*”, Beverly Hills, C.A.; Sage, 1981.
- [21] J. H. Lim, “The Relations Among Kindergarten Beginning Teacher’s Self-Efficacy, Social Support and Occupational Stress”, Ewha Womans University Press, 2000.
- [22] S. Cohen, & H. Hoberman, “Positive events and social support as buffers of life change stress”, *Applied Journal of Applied Social Psychology*, Vol. 13, pp.19-125, 1983.
- [23] S. Cohen, & T. A. Wills, “Stress, social support,

- and the buffering hypothesis”, *Applied Psychological Bulletin*, Vol. 98, pp.310-357, 1985.
- [24] D. H. Ahn, & J. A. Kim, “Resilience of University Students: Coping Strategies, Social Support, Competence, and Academic Performance”, *Applied Korean Educational Psychology Association*, Vol. 21, No. 1, pp.47-67, 2007.
- [25] H. J. Lee, “The Assessment of Prediction Capacity of Epistemic Beliefs, Self-Control Study Capacities, and the Sense of Social Presence over Training Achievements Perceived at Online Professional Learning Communities”, *Ewha Woman’s University*, 2013.
- [26] K. J. Hwang, “The development of the training program for social support skills of middle and high school teachers”, *Korea National University of Education*, 2009.
- [27] G. D. Borich, “A needs assessment for conducting follow-up studies”, *Applied The Journal of Teacher Education*, Vol. 31, No. 3, pp.39-42, 1980.
- [28] J. S. Kim, “The ego resilience, social support, awareness of the instructional outcome of pre-service teacher in university classes using SNS(Social Network Service)”, *Journal of Digital Convergence*, Vol. 14, No. 2, pp.31-39, 2016.
- [29] Y. J. Lee, & H. J. Gil, “Perception and Attitude of Pre-Service Early Childhood Education Teacher about The Introduction and Utilization of Smart Education”, *Journal of Digital Convergence*, Vol. 14, No. 1, pp.13-23, 2016.
- [30] S. N. Lee, “A Study on Theory of Planned Behavior of Accounting Information Classes in the Digital Convergence Era”, *Journal of Digital Convergence*, Vol. 13, No. 9, pp.169-175, 2015.
- [31] N. S. Seo, S. J. Woo, & Y. J. Ha, “The Effects of Self-directed Learning Ability and Motivation on Learning Satisfaction of Nursing Students in Convergence Blended Learning Environment”, *Journal of Digital Convergence*, Vol. 13, No. 9, pp.11-19, 2015.
- [32] S. W. Lee, “A Study to Improve Full-Cyber Lectures: with Focus on Instructors’ Proposal”, *Journal of Digital Convergence*, Vol. 11, No. 4, pp.409-414, 2013.
- [33] S. Y. Park, & K. Lim, “Suggestions for Building ‘Smart Campus’ Based on Case Studies on the Effectiveness of Instructions with Smart-Pads”, *Journal of Digital Convergence*, Vol. 10, No. 3, pp.1-12, 2012.
- [34] J. Y. Chang, “Convergence of Education and Information & Communication Technology : A Study on the Communication Characteristics of SNS Affecting Relationship Development between Professor and Student”, *Journal of the Korea Convergence Society*, Vol. 6, No. 6, pp. 213-219, 2015.
- [35] E. H. Park, Hye-Suk Kim, Ja-Ok Kim, “The Effect of Convergence Action Learning techniques in Simulation Class”, *Journal of the Korea Convergence Society*, Vol. 6, No. 5, pp. 241-248, 2015.
- [36] H. J. Keum, “The basic theoretical research for a practice of university faculty member’s teaching reflection”, *Journal of Digital Convergence*, Vol. 14, No. 2, pp.57-63, 2016.

양 미 석(Yang, Mi Seok)



- 1997년 2월 : 한남대학교 법학과 (법학사)
- 2013년 2월 : 충남대학교 교육학과 (교육학석사)
- 2014년 2월 : 충남대학교 교육학과 (교육학 박사수료)
- 2014년 3월 ~ 현재 : 충남대학교 연구원

- 관심분야 : 이러닝, 학습역량, 디지털 리터러시
- E-Mail : yms3470@cnu.ac.kr

조 영 선(Cho, Young Sun)



- 1989년 2월 : 충남대학교 가정교육과(가정학사)
- 1999년 2월 : 충남대학교 식품영양학과(가정학석사)
- 2004년 2월 : 충남대학교 식품영양학과(이학박사)
- 2005년 3월 ~ 현재 : 목원대학교 교양학부 겸임 및 외래강사

- 관심분야 : 이러닝, 학습역량, 원격교육
- E-Mail : tosil97@hanmail.net

김 지 숙(Kim, Ji Suk)



- 1999년 8월 : 충남대학교 교육학과 (교육학사)
- 2004년 2월 : 충남대학교 교육학과 (교육학석사)
- 2012년 8월 : 충남대학교 교육학과 (교육학박사)
- 2013년 3월 ~ 현재 : 백석대학교 사범학부 조교수

- 관심분야 : 대학교육, 교수설계, 원격교육, 이러닝
- E-Mail : jjskim@bu.ac.kr