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Core Competencies and Employability: The Mediating Roles of Digital Literacy and Learning Strategies[1]

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Abstract

This study examined the mediating roles of digital literacy and learning strategies in the influence of core competencies on employability. Participants of this study were 916 college students in 10 Korean colleges. Data analysis consisted of descriptive statistics, reliability testing, correlation analysis, and structural equation modelling. The results showed that core competency had a positive effect on employability. Learning strategies mediated the influence of core competence on employability; digital literacy did not. There was a significant multi-mediated effect of digital literacy through learning strategy on the influence of core competence on employability. These findings suggest that college students need to develop such strategies for themselves or participate in structured programs provided by their colleges to make effective use of learning strategies. Also, because learning strategy may be a catalyst for digital literacy, it is indispensable for college teachers to point out the effective use of learning strategies using mainly digital devices and resources. It is necessary to conduct follow-up research such as experimental and quasi-experimental research to verify the influence of core competencies on employability depending on learners' characteristics such as learning styles, self-efficacy, and achievement goal orientations.

Keywords: Core competency; Employability; Learning strategy; Digital literacy; College students.

1. Introduction

Korea's youth unemployment rate is approaching 9.0% (KRIVET, 2018). Of the newly hired college graduates, 64% may be irregular workers and leave their workplace within two years after employment (Lee, 2015); whereas 16% may be "NEETs" (Oh, 2015). More than half of college students face graduation delays due to the difficulty in preparing for a career (Chae, 2016a;2016b). Yang (2017), reported that 22.1% of college students preparing for employment took a leave of absence from their colleges to prepare for employment through such programs as language training, internships, and obtaining certification.

Korean colleges have invested enormously in employment support programs such as capstone design, on-the-job training, entrepreneurial education, employment and career counselling, and internships with domestic and overseas companies (Choi and Shin, 2016; Seo and Kim, 2016; Shin *et al.*, 2013). Additionally, the colleges have also developed and provided programs enhanced by digital technologies, including programs in business analytics, 3D printing and artificial intelligence (AI), and coding education (The Ministry of Education, 2018).

In spite of the significant influence of employment-enhanced curriculum and programs provided by colleges for enhancing college students' employability, colleges need to consider students' individual characteristics such as core competencies, digital literacy, and learning strategies. College students need to learn the knowledge and vocational skills of their major in the classroom to improve their employability. Also, they need to help students strengthen their core competency as the precedent variable to determining employability (Fugate *et al.*, 2004; Van der Heijde and Van der Heijden, 2006; Vanhercke *et al.*, 2014).

College students must take part in the digital-based, knowledge-driven economy. Currently, they are required to develop digital literacy related to effectively acquiring and utilizing knowledge and information as well as a variety of digital learning platforms, tools, and resources for their learning activities and competency development. Digital literacy is related to the essential capabilities of social participation, effective collaboration and communication, critical thinking and problem-solving through digital tools, and managing information and data (Gallardo-Echenique *et al.*, 2015; Hatlevik and Christophersen, 2013).

College students need to use relevant learning strategies influencing training and learning outcomes in a digital environment (Kesici *et al.*, 2009). For example, they may improve their cognitive strategies, meta-cognitive strategies, and resource management strategies by using smart learning devices for efficient notes, summaries, and presentations in exploring and analyzing diverse knowledge and information through the Internet. Also, students can collaboratively discuss and solve problems through digital media including social media platforms. Cho and Cho (2013), found that learning strategies facilitated metacognition and mutual cooperation in group project implementation. Cassidy (2006), suggest that enhancing job skills through peer learning and mutual evaluation influenced self-perceived employability.

College students need to be ready to work in a knowledge-based, networked society and economy. Colleges have already been carrying out competency-centered education and training that is appropriate for enhancing

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students' employability. College students can develop their employability in terms of core competencies by practicing their own learning strategies in digital learning environments where digital literacy is required. Thus, it is necessary for college students to use their own learning strategies for competency development and future employability in learning environments where digital literacy is required.

Ultimately, college students need to be ready to work in a knowledge-based, networked environment. Universities are carrying out competency-centered education and training to develop core competency that are appropriate for the knowledge and information society, especially digitally-based occupational environments. This study contributes to that work by examining whether core competency in college students affect their employability. When students use learning strategy effectively in the digital learning environment, it is important to consider that the performance of job-related learning using digital devices and applications will promote the development of core competency and thus the employability. In this vein, this study explores whether developing core competency in ICT-based learning environments contributes to improving employability through digital literacy and learning strategy.

2. Theoretical Background

2.1. Employability

Employability is defined differently by each scholar. Vanhercke *et al.* (2014), defined employability as "the individual's perception of his or her possibilities of obtaining and maintaining employment" (p. 594). De Vos *et al.* (2011) defined employability as "the continuous fulfilling, acquiring, or creating of work through the optimal use of competences" (p. 439). Rothwell *et al.* (2008), conceptualized employability as "the perceived ability to attain sustainable employment appropriate to one's qualification level" (p. 2). In this regard employability is concerned with college students' subjective evaluation of job-related preparation or self-conception of future job-getting and maintenance (Cuyper *et al.*, 2008; Okay-Somerville and Scholarios, 2017).

Employability can be categorized into *internal* and *external* employability. Forrier *et al.* (2015), argued that employability is connected not only to the internal labor market within one's own organization or with the present employers but also to the external labor market without one's own organization or with other employers. *Internal employability* is concerned with the self-confidence of individuals' skills and abilities as well as with the maintenance and success in the present workplace (Rothwell *et al.*, 2009). For example, it includes such perceptions as "Even if there was downsizing in this organization, I am confident that I would be retained" (Rothwell and Arnold, 2007). *External employability* is related to the worker's beliefs about how easy it is to find new employment with another employer and to see through the recent trends in labor market (De Cuyper *et al.*, 2012; Rothwell *et al.*, 2008); for instance, the worker may express the belief that "If I needed to, I could easily get another job like mine in a similar organization" (Rothwell and Arnold, 2007).

2.2. Core Competency and Employability

Core competency is defined as the college students' cognitive, affective, and social skills needed to ensure both present and future success and a competitive advantage in their academic and professional lives (Boyatzis R. E. S., A., 2008; Boyatzis R. E., 2009; Wang *et al.*, 2011). Core competencies are correlated with employability on account of one's willingness to develop new competencies (Wittekind *et al.*, 2010); self-efficacy (Qenani *et al.*, 2014); and personal adaptability and social capital (Robles, 2012). Scholars have tended to regard core competency as a significant determinant for employability, because stronger core competency can be seen by future employers as an attractive asset the premise that the potential employees have continued to develop their skills after graduation (Fugate *et al.*, 2004; Van der Heijde and Van der Heijden, 2006; Vanhercke *et al.*, 2014).

2.3. The Roles of Digital Literacy and Learning Strategies in Relation to Core Competencies and Employability

Digital literacy may be referred to as the essential capabilities not only for understanding and using digital technologies and applications but also for social participation, effective collaboration, and critical problem-solving via digital tools, information, and data (Calvani *et al.*, 2012; Gallardo-Echenique *et al.*, 2015). Digital literacy has been identified as a catalyst or an accelerator for core competencies because it influences how digital tools are used; how information is collected, analyzed, and utilized; and how individual and collaborative learning occurs through digital resources (Ala-Mutka, 2011; Ferrari, 2012). van Puijenbroek *et al.* (2014), argued that the more learners use social media relevantly and effectively, the more critical thinking and cognitive skills are promoted. Janssen *et al.* (2009), maintained that online team activities between organization members affect mutual collaboration and positive critical feedback by promoting empathy, social skills, and interpersonal relationships.

Digital literacy may be combined with employability in that the use of digital tools and information may be correlated with future job performance and employability in classrooms or workplaces requiring problem-solving, communication, and collaborative skills. Yen (2012), argued that employability tends to be determined by information and digital literacy. Garrido *et al.* (2012), stated that developing information and communication technology (ICT) skills can improve job skills and increase employability. In this respect, digital literacy may be associated with employability through the influence of core competencies.

Learning strategies consist of skills, methods, or techniques used to understand and promote learning and task performance (Schunk, 2004). According to Pintrich *et al.* (1991); one's learning strategies include cognitive strategies (e.g., rehearsal, elaboration, organization, critical thinking), meta-cognitive strategies (e.g., planning,

monitoring, and regulating strategies), and resource management strategies (e.g., time management, effort management, peer learning, and help-seeking).

Learning strategies may play an important role in cultivating core competencies such as task/project performance (Alexiou and Paraskeva, 2010; Kauffman *et al.*, 2011); problem-solving (Cerezo *et al.*, 2010); and teamwork and collaboration (Lee S. W. Y. and Tsai, 2011). English and Kitsantas (2013) stated that the challenges for problem-solving and the success of a project are closely related to learning strategies such as monitoring and reflection. Kiliç-Çakmak (2010), stated that learning strategies such as meta-cognition, effort management, and elaboration facilitated information collection, management, and creation. D'Souza (2013), suggested that mutual discussion and conversation with peers helps students to develop competencies such as critical thinking and communication.

In addition, learning strategies may affect digital literacy. Kesici *et al.* (2009), found that cognitive learning strategies affect students' attitudes and utilization of computers. Cheng and Chau (2013), found that using digital-based portfolios is more effective when college students go through cognitive and metacognitive strategies. Rogers and Swan (2004), suggested that there is a correlation between the learning strategies that college students employ in Internet searches and the students' ability to articulate and perform learning and project tasks through self-regulated learning skills. Banyard *et al.* (2006), suggested that cognitive and meta-intellectual utilization are related to information literacy. Dabbagh and Kitsantas (2012), suggested that learning strategies could vary with the use of Web-based collaboration and communication tools.

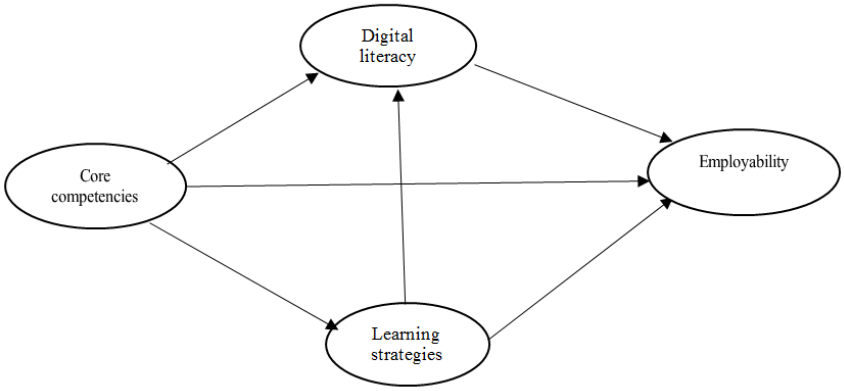
It is unclear whether digital literacy and learning strategies play mediating roles in the influence of core competencies on employability. However, it is possible to use existing research to estimate the impact of the mediating roles of digital literacy and learning strategies upon the relationship between core competencies and employability. To illustrate, De Vos *et al.* (2011) suggested that an individual's self-reflection on their job performance enhances employability. Cho and Cho (2013), found that the use of self-regulated learning strategies in SNS-based learning facilitated metacognition and mutual cooperation in group project implementation. Wu (2015) suggested that mental and behavioral strategies are effective in promoting and developing self-efficacy and information seeking ability when students use social media. Bulu and Pedersen (2012), suggested that metacognition plays an important role in problem-solving tasks in the hypermedia learning environment. Thus, this study is significant because it examines the mediating roles of digital literacy and learning strategies in the influence of core competency on employability.

3. Research Design and Methods

3.1. Research Model and Hypotheses

This study explores whether developing core competency in ICT-based learning environments contributes to improving employability through the mediating roles of digital literacy and learning strategy. The research model and hypothesis for this study are as follows.

Figure-1. Structural Model



Hypothesis 1. Core competencies are associated with employability.
Hypothesis 2. Digital literacy is associated with employability.
Hypothesis 3. Digital literacy mediates the relationship between core competencies and employability.
Hypothesis 4. Learning strategies are associated with employability.
Hypothesis 5. Learning strategies mediate the relationship between core competencies and employability.
Hypothesis 6. Learning strategies are associated with digital literacy.
Hypothesis 7. Digital literacy and learning strategies multi-mediate the relationship between core competencies and employability.

3.2. Research Design

This study employed a correlational design conducted to assess the relationships that existed between two or more variables by using either a research question or a hypothesis. Statistical techniques such as correlation analysis,

multiple regression analysis, and structural equation modeling were employed to explore the strengths and directions of the relationships among independent, dependent, and mediating variables. The correlational design that was used enabled the examination of the measured variables retrospectively at a single point in time by gathering data with commonly used questionnaires, which mainly comprised closed questions with multiple-choice questions (Fraenkel *et al.*, 1993; Wood and Brink, 1998).

3.3. Participant Sample

This study applied convenience sampling to members of the target population who met certain practical criteria, such as easy accessibility, geographical proximity, availability at a given time, and willingness to participate (Etikan *et al.*, 2016; Farrokhi and Mahmoudi-Hamidabad, 2012). The sample of this study comprised 916 voluntary participants during the Spring and Fall 2017 semesters from 10 universities in the Korean cities of Seoul, Daegu, Cheonan, Cheongju, and Suncheon. Each college student took approximately 20 minutes to complete the questionnaire. The responses of the 916 participants were analyzed as the final dataset. Of these students, 350 (38.2%) were male and 566 (61.8%) were female. The major breakdown was as follows: 389 (42.5%) majored in humanities and social sciences, and 527 (57.5%) were in science and engineering. More than half (57.4%, N = 526) were enrolled at 4-year colleges, and the remainder (42.6%) were enrolled at 2-year colleges. Moreover, 320 were at public colleges (34.9%), and 596 were at private colleges (65.1%).

Table-1. Participant sample for this study

Participants		**N**	**%**
Gender	Male	350	38.2
	Female	566	61.8
Major	Humanities & Social Sciences	389	42.5
	Science & Engineering	527	57.5
Type of school	4-year	526	57.4
	2-year	390	42.6
	Public	320	34.9
	Private	596	65.1
Total		916	100.0

3.4. Measurement Tools

The measures formulated in this study were based upon questionnaires that had been validated by prior researchers. It is possible that there is a limitation in assuring the accuracy and objectivity of the measurement because the measure involved the perceptions or beliefs of college students about measured variables rather than objectively measured abilities relating to digital literacy, core competencies, and employability. The questionnaires measured in this study are as follows.

Core competencies were measured via a Korean self-report instrument validated by Kim *et al.* (2010). The scale was designed to assess the degree to which Korean college learners had the cognitive, affective, and social skills needed to ensure success and a competitive advantage in their present and future academic and professional lives. As shown in Table 1, there are 28 items consisting of seven sub-variables. The scales were evaluated on a 5-point Likert format (1 = strongly disagree and 5 =strongly agree). Cronbach's alpha (α) for the items proposed by Kim *et al.* (2010) were as follows: communication and human relationship (α = .79, 7 items, e.g., "I listen and respect others' opinions"), expertise (α = .81, 4 items, e.g., "I am able to strategically utilize expertise to fit problem situations"), creativity (α = .81, 2 items, e.g., "I think in a variety of ways"), self-directedness (α = .79, 5 items, e.g., "I can set my own learning goals"), general job skills (α = .81, 4 items, e.g., "I know the skills in my future career"), international mindset (α = .76, 3 items, e.g., "I can identify global trends in your area of interest"), and problem-solving ability and thinking (α = .76, 3 items, e.g., "I am able to derive appropriate information for problem solving"). The items and Cronbach's α of the sub-variables in the present study were communication and human relationships (α = .85), expertise (α = .79), creativity (α = .82), self-directedness (α = .86), general job skills (α = .77), international mindset (α = .74), and problem-solving ability and thinking (α = .84).

Digital literacy is an ability to use digital technologies to navigate, collect, analyze, and evaluate information and knowledge; to construct new information; to create digital expression; and to communicate with others for learning processes. Digital literacy was measured using an English self-report scale designed and validated by Ozdamar-Keskin *et al.* (2015). This measure, which examines the security and ethics level as well as the students' abilities to understand and use digital tools and platforms, was translated into Korean by the author and featured 22 items in the following four sub-variables: ability to use digital learning tools, managing digital learning platforms, ability to use advanced level digital tools, and security and ethics. The items of Ozdamar-Keskin *et al.* (2015) and their respective Cronbach's α values were ability to use digital learning tools (α = .90, 5 items, e.g., "I can join to the events on social networks"), managing digital learning platforms (α = .92, 6 items, e.g., "I can upload files (visual or audio) to digital platforms"), ability to use advanced level digital tools (α = .90, 7 items, e.g., "I can write a QR code and manage it"), and security and ethics (α = .86, 4 items, e.g., "I know the digital rights of ownership"). The items and Cronbach's α of the sub-variables in the present study were ability to use digital learning tools (α = .79), managing digital learning platforms (α = .85), ability to use advanced level digital tools (α = .83), and security and ethics (α = .83).

Learning strategies were measured using the Motivated Strategies for Learning Questionnaire (MSLQ), an English self-report instrument designed to measure the cognitive and behavioral skills, methods, or techniques used to understand and promote learning and task performance (Pintrich *et al.*, 1991). The MSLQ was translated into Korean by the author. The MSLQ has two sections, Motivation and Learning Strategies, comprising 81 items categorized under 15 different sub-variables. Fifty of these items in nine sub-variables, all from the Learning Strategies section, were utilized for this study. The scales used a 7-point Likert format (1 = strongly disagree and 7 =strongly agree). The items and Cronbach's α of the sub-variables in the original study were rehearsal (4 items, α = .69, e.g., "I memorize key words to remember important concepts in this class"), elaboration (6 items, α = .76, e.g., "I try to relate ideas in this subject to those in other courses whenever possible"), organization (4 items, α = .64, e.g., "I make simple charts, diagrams, or tables to help me organize course material"), critical thinking (5 items, α = .80, e.g., "Whenever I read or hear an assertion or conclusion in this class, I think about possible alternatives"), metacognitive self-regulation (12 items, α = .79, e.g., "When I become confused about something I'm reading for this class, I go back and try to figure it out on my own"), time and study environment (8 items, α = .76, e.g., "I make good use of my study time for this course"), effort regulation (4 items, α = .69, e.g., "I work hard to do well in this class even if I don't like what we are doing"), peer learning (3 items, α = .76, e.g., "When studying for this course, I often try to explain the material to a classmate or a friend"), and help-seeking (4 items, α = .56, e.g., "I ask the instructor to clarify concepts I don't understand well"). The items and Cronbach's α of the sub-variables in the present study were rehearsal (3 items, α = .65), elaboration (5 items, α = .74), organization (4 items, α = .74), critical thinking (5 items, α = .71), metacognitive self-regulation (12 items, .80), time and study environment (8 items, α = .84), effort regulation (4 items, α = .66), peer learning (2 items, α = .71), and help-seeking (3 items, α = .66).

Employability refers to the belief in one's own ability to obtain a job, retain it, and enhance employment opportunities for new careers. Employability was assessed through sub-variables validated by Rothwell and Arnold (2007) and translated into Korean by the author. The scales used a 5-point Likert format (1 = strongly disagree and 5 = strongly agree). The Cronbach's α and items of Rothwell and Arnold (2007) were internal employability (α = .72, 4 items, e.g., "My personal networks will help me in my future career") and external employability (α = .79, 7 items, e.g., "I could get any job, anywhere, so long as my skills and experience are reasonably relevant"). The items and Cronbach's α of the sub-variables in the present study were internal employability (α = .72) and external employability (α = .83)

3.5. Data Analysis

The data analysis for this study yielded the kurtosis and skewness to verify the normality of the data. Cronbach's α for reliability of the scales used in this study was determined via a correlation analysis using SPSS 24. When compared with the reliability coefficient of the original scale, the reliability of the variables in this study was not found to be significantly higher or lower than that of the original variables. However, some items—one in rehearsal (item 46), one in elaboration (item 62), one in peer learning (item 50), and one in help seeking (item 68) under learning strategies—were deleted because their alpha values decreased. Most variables except for three—rehearsal (.65), effort regulation (.66), and help seeking (.66)—had coefficients of .7 or higher. The justification for considering these three variables to be accurate follows extant research (Cicchetti, 1994; George and Mallery, 2003; Nunnally and Bernstein, 1994) that considers .60 to be acceptable.

To perform structural equation analysis using AMOS 24, construct validity was assessed by convergent validity for a measurement model. Convergent validity was assessed by the construct reliability and the Average Variance Extracted (AVE) of the factors in the measurement model. To assess the structural model fit, the following indexes were used by the maximum likelihood estimate: chi-square statistics and CMIN/df (chi-square divided by the degrees of freedom), goodness-of-fit index (GFI), standardized root mean residual (SRMR), confirmatory fit index (CFI), and root mean square error of approximation (RMSEA) formulated by Kline (2005).

Bootstrapping was used to test for the significance of the mediation effect as suggested by Shrout and Bolger (2002). Bootstrapping shows the 95% confidence interval (CI) for the significance of mean indirect effect from the bootstrap results. If the CI does not include zero, then the indirect effect is considered statistically significant at the 0.05 level. However, in AMOS, because only the indirect effect on all parameters is derived through bootstrapping in the multi-path effect with more than two parameters, the specific indirect effect related to each parameter cannot be obtained separately (Huh, 2013). Therefore, the significance of the multiple mediation effect was tested by the bootstrapping method after generating a phantom variable (Rindskopf, 1984). A *phantom variable* is a kind of virtual variable that does not affect the model fitness and model values and is a technical method for deriving bootstrapping for specific indirect effects of each individual parameter through a transformation model (Huh, 2013).

4. Results

4.1. Descriptive Statistics and Correlations

The assessment of whether a distribution is normal or not is dependent on skewness and kurtosis value. According to Kline (2005); if the absolute value of kurtosis is greater than 10 and the absolute value of skew is greater than 3, it is judged to be in violation of normal distribution. Table 2 shows that the data used in this study were found to be within normal range of skewness (-1.003 ~ .204) and kurtosis (-.241 ~ 5.182) in all observed variables. Table 2 shows the results of the correlations between the variables used in this study. Overall, there was a statistically significant correlation between the observed variables, which showed a significance level of .01. As a

result of the correlation between the variables, there was no correlation between all the measured variables with a high correlation of .85 or more (Kline, 2005).

Table-2. Descriptive statistics and correlations of observed variables

variable		M	SD	Skew	kurtosis	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ	ⓕ	ⓖ	ⓗ	ⓘ	ⓙ	ⓚ	ⓛ	ⓜ	ⓝ	ⓞ	ⓟ	ⓠ	ⓡ	ⓢ	ⓣ	ⓤ	ⓥ
Digital literacy	ⓐ	3.78	0.72	-.502	.590	1																					
	ⓑ	3.38	0.81	-.099	-.241	.663**	1																				
	ⓒ	2.98	0.75	.111	.131	.462**	.675**	1																			
	ⓓ	3.37	0.83	-.221	.038	.538**	.616**	.641**	1																		
Learning strategy	ⓔ	4.72	0.81	.047	.514	.339**	.274**	.141**	.303**	1																	
	ⓕ	4.50	0.86	-.099	.555	.291**	.284**	.214**	.337**	.611**	1																
	ⓖ	4.65	0.99	.046	.328	.316**	.304**	.254**	.326**	.536**	.604**	1															
	ⓗ	4.50	0.91	-.080	.756	.280**	.298**	.244**	.309**	.545**	.591**	.718**	1														
	ⓘ	4.40	0.74	.156	1.119	.277**	.308**	.284**	.334**	.539**	.610**	.654**	.708**	1													
	ⓙ	4.82	0.88	.101	.336	.389**	.336**	.204**	.365**	.624**	.617**	.682**	.639**	.669**	1												
	ⓚ	4.87	0.95	-.257	.264	.359**	.290**	.174**	.269**	.505**	.503**	.586**	.594**	.542**	.703**	1											
	ⓛ	4.75	0.93	.052	.082	.254**	.221**	.132**	.226**	.463**	.440**	.454**	.470**	.532**	.568**	.479**	1										
	ⓜ	4.36	0.84	.204	.866	.200**	.251**	.255**	.261**	.386**	.490**	.533**	.558**	.631**	.580**	.484**	.483**	1									
Core competency	ⓝ	3.89	0.53	-1.003	5.182	.325**	.231**	.150**	.223**	.320**	.292**	.343**	.271**	.250**	.326**	.339**	.183**	.195**	1								
	ⓞ	3.32	0.70	-.298	.662	.262**	.305**	.288**	.273**	.235**	.305**	.399**	.367**	.339**	.354**	.344**	.195**	.332**	.420**	1							
	ⓟ	3.50	0.78	-.281	.460	.204**	.246**	.220**	.227**	.208**	.259**	.323**	.305**	.268**	.290**	.259**	.116**	.218**	.443**	.474**	1						
	ⓠ	3.68	0.69	-.568	1.150	.282**	.288**	.228**	.288**	.391**	.357**	.493**	.401**	.356**	.472**	.388**	.251**	.356**	.506**	.548**	.428**	1					
	ⓡ	3.44	0.67	-.288	.869	.257**	.282**	.284**	.304**	.274**	.302**	.386**	.368**	.371**	.349**	.347**	.223**	.360**	.455**	.606**	.445**	.576**	1				
	ⓢ	2.99	0.85	-.197	-.068	.219**	.243**	.308**	.275**	.156**	.275**	.283**	.311**	.301**	.234**	.162**	.098**	.224**	.282**	.474**	.305**	.372**	.418**	1			
	ⓣ	3.52	0.66	-.194	1.004	.341**	.322**	.270**	.345**	.378**	.358**	.401**	.366**	.357**	.386**	.333**	.217**	.262**	.505**	.479**	.596**	.558**	.540**	.454**	1		
employability	ⓤ	3.57	0.58	-.027	.554	.380**	.276**	.215**	.271**	.355**	.375**	.438**	.380**	.355**	.410**	.369**	.255**	.330**	.416**	.410**	.329**	.451**	.413**	.235**	.441**	1	
	ⓥ	3.49	0.63	.050	.285	.331**	.234**	.257**	.289**	.345**	.363**	.445**	.400**	.376**	.392**	.387**	.235**	.324**	.371**	.409**	.373**	.450**	.488**	.315**	.457**	.688**	1

** p < .01.

Note: ⓐ ability to use digital learning tools ⓑ managing digital learning platforms ⓒ ability to use advanced level digital tools ⓓ security and ethics ⓔ rehearsal ⓕ elaboration ⓖ organization ⓗ critical thinking ⓘ metacognitive self-regulation ⓙ time and study strategies ⓚ effort regulation ⓛ peer learning ⓜ help-seeking ⓝ communication & human relationship ⓞ expertise ⓟ creativity ⓠ self-directedness ⓡ general job skills ⓢ international mindset ⓣ problem-solving ability and thinking ⓤ internal employability ⓥ external employability **(N=916)**

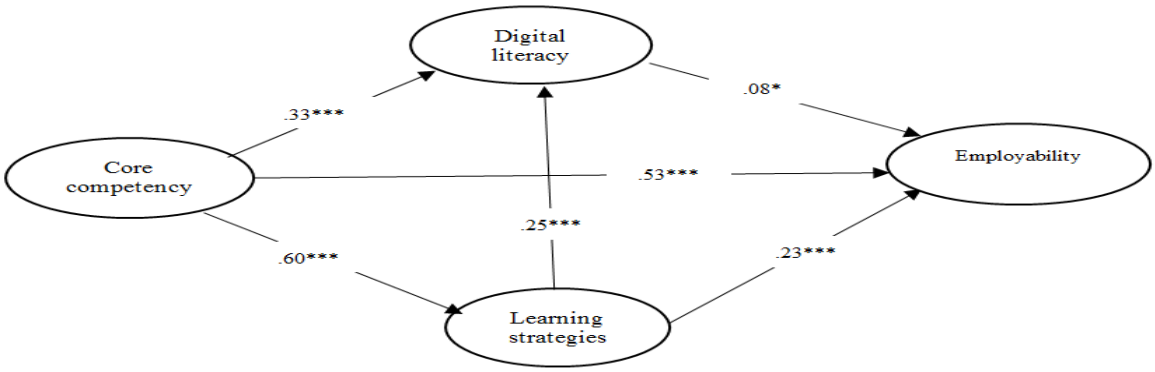
4.2. Testing the Measurement Model

The measurement model needed to confirm that the latent variables first were represented by observed variables and then assessed the hypothesized structural model. Several indices were calculated to evaluate the fit of the model to the data: chi-square (χ^2/df < 2.0 suggests a good fit), the comparative fit index (CFI > .90), the Tucker–Lewis index (TLI > .90), the goodness-of-fit index (GFI > .90), the root mean square error of approximation (RMSEA < .05), and the standardized root mean square residual (SRMR < .05). The measurement model showed good fit statistics for the latent variables, χ^2 (199) = 899.945, p = .001, χ^2/df = 4.522, GFI = .91 SRMR= .042 CFI= .94 TLI =.93 and RMSEA= .06. All standardized loadings on the variables were significant (p < .001; range .54-84 for each variable), supporting construct validity of the scales. Also, construct validity may be assessed by convergent validity as a set of variables presumed to assess the same construct (Kline, 2005). Convergent validity is assessed by the construct reliability and the Average Variance Extracted (AVE) of the factors in the measurement model. Theoretically, if the conceptual reliability is 0.7 or more and AVE is 0.5 or more, the validity of the measurement model is satisfactory (Yu, 2012). As shown in Table 2, the conceptual reliability of each concept was .919 for digital literacy, .923 for core competency, .937 for learning strategy, and .924 for employability. In addition, AVE has a validity of the measurement model with digital literacy of .738, core competency of .636, learning strategy of .625, and employability of .859.

4.3. Testing the Structural Model

The structural model showed good fit statistics for the latent variables, χ^2 (196) = 811.583, p = .001, χ^2/df = 4.141, GFI = .92 SRMR= .04 CFI= .95 TLI =.94 and RMSEA= .06. All pathways for this model were significantly positive, as represented in Figure 2. The direct path coefficients from core competency to digital literacy, learning strategy, and employability were significant (β=.33, p<.001, β=.60, p<.001 and β=.53, p<.001, respectively). The direct path coefficient from digital literacy to employability was significant (β=.08, p<.05). The direct path coefficients from learning strategy to digital literacy and employability were significant (β=.25, p<.001, β=.23, p<.001, respectively). The direct and indirect effects between pathways are depicted in Table 3. The proportion of explained variance for the model presented by squared multiple correlations (SMC) was 36.2% for core competencies, 26.8% for digital literacy, and 54.1% for employability (Kline, 2005).

Figure-2. Final structural model



Note: Standardized β coefficients are reported; $^{*}p < .05$. $^{***}p < .001$.

Table-3. Effect decomposition of the structural model

Independent variable	Dependent variable	Direct effect	Indirect effect	Total effect	*SMC* (R^2)
Core competency	Learning strategies	.602	-	.602	.362
Core competency	Digital literacy	.327	.149	.476	.268
Learning strategy		.248	-	.248	
Core competency	Employability	.526	.174	.700	.541
Learning strategy		.228	.019	.247	
Digital literacy		.077	-	.077	

Bootstrapping was used to test for the significance of the mediation effect as suggested by Shrout and Bolger (2002). Bootstrapping shows the 95% confidence interval (CI) for the significance of mean indirect effect from the bootstrap results. If the CI does not include zero, then the indirect effect is considered statistically significant at the .05 level. AMOS suggests the mediating effect of a single parameter, but the multiple mediating effect is difficult to identify because AMOS only tests for statistical significance. In this study, the multiple mediating effect was confirmed using the phantom parameter. As Table 4 shows, Bootstrapping analysis for the mediating effect of digital literacy on the relationship between core competency and employability (b = .065, 95% CI: -.006-.141) was not significant because 0 is included. However, the mediating effect of learning strategy on the relationship between core competency and employability was statistically significant (b = .189, 95% CI: .120-.309) and so was the mult-mediating effect of learning strategy and digital literacy on the relationship between core competency and employability (b = .130, 95% CI: .086~.191).

Table-4. *Bootstrapping for the mediating effect test*

Pathway	Unstandardized (b)	S.E.	95% CI (bias-corrected)
Core competency → learning strategy → employability	.189	.034	.120~.309**
Core competency → digital literacy → employability	.065	.031	-.006~.141
Core competency → learning strategy → digital literacy → employability	.130	.023	.086~.191**

** $p < .01$

5. Discussion

This study examined the roles of digital literacy and learning strategies in the influence of core competencies on employability. The discussions of the results of this study are as follows.

Core competencies were significantly associated with employability (Hypothesis 1). This finding indicates that if college students develop core competencies, they tend to increase employability (Fugate *et al.*, 2004; Van der Heijde and Van der Heijden, 2006; Vanhercke *et al.*, 2014). In addition, this study provides evidence that core competencies are necessary for the performance of future jobs, and they are characteristics inherent in employability. Robles (2012), mentioned that the soft skills similar to core competency are needed in today's workplace and college graduates may be expected to have such a skillset by employers for skilled jobs. Harvey (2001), argued that employability may be a propensity of graduates to exhibit any capacity and attributes that employers may consider necessary for effective job performance. Qenani *et al.* (2014), maintained that employability is related to the individual knowledge and skills that college students obtain through formal or informal college education.

Core competencies were positively associated with digital literacy (Hypothesis 2). This indicates that digital literacy may contribute to heightening problem-solving, communication and collaboration with others, and critical

thinking through the relevant and effective use of digital devices and applications (Hatlevik and Christophersen, 2013). However, this study revealed that digital literacy did not mediate the relationship between core competence and employability (Hypothesis 3). This result was not in line with the arguments that ICT skills can help to improve job skills and increase employability (Garrido *et al.*, 2012).

Learning strategies were highly associated with employability (Hypothesis 4). Learning strategies significantly mediated the relationship between core competency and self-perceived employability (Hypothesis 5). Learning strategies were positively associated with digital literacy (Hypothesis 6). This means that digital literacy may be facilitated by learning strategy (Liu *et al.*, 2011; Willem *et al.*, 2006). Moreover, learning strategies and digital literacy multi-mediated the relationship between core competence and employability (Hypothesis 7). These results imply that employability can be improved through learning strategies that play an important role in cultivating core competency such as task/project performance (Alexiou and Paraskeva, 2010; Kauffman *et al.*, 2011); problem-solving (Cerezo *et al.*, 2010); and teamwork and collaboration (Dabbagh and Kitsantas, 2012; Järvelä and Järvenoja, 2011; Lee S. W. Y. and Tsai, 2011).

This study suggests that colleges need to provide their students with competency-based, employment-enhanced curricula and programs for improving their employability, in that college students are more likely to be employed when digital literacy and learning strategies facilitate core competencies. In this regard, colleges need to consider learning strategies in designing and providing competency-based curricula and employability skill programs. Also, colleges need to strengthen the effective use of learning strategies such as elaboration, organization, and meta-cognition by providing students with digital visualizers, idea mapping, simulations, and scenarios as well as online collaboration and feedback using digital technologies such as SNS, holograms, virtual reality (VR), augmented reality (AR), and 3D printing. Additionally, colleges can help students to understand the job skills required by employers, can provide real-time feedback on resumes and self-introduction letters by using AI and robot programs, and can provide real interview practice by using holograms and VR. Finally, colleges also need to build digitally driven quality assurance and continuous improvement through employability data monitoring and students' learning analytics, using tools such as Moodle, for conducting employment preparation activities as well as creating e-Portfolios for the feedback and reflection on learning (Brammar and Chatterton, 2014; Chatterton and Rebbeck, 2015).

6. Limitations and Future Research

This study had four limitations, which gave rise to the following suggestions for future research. First, it is necessary to investigate the differences in core competencies and employability in terms of sub-variables of student learning strategies. This analysis may be useful in developing personalized teaching and learning methods and learning resources such as textbooks and digital technologies to build a classroom environment in accordance with specific cognitive and metacognitive learning strategies.

Second, this study was oriented toward a correlational research design to facilitate the investigation of correlations and causality between variables. This design is significant because of its ability to confirm the relationship between variables through empirical tests. However, in the context of teaching and learning at the college level, it is uncertain that the influence of core competencies on employability can be improved through digital literacy and learning strategies. Therefore, in future research, it is necessary to conduct experiments or quasi-experimental studies on the effect of learning strategies using digital technologies on building and strengthening core competencies and employability by using random sampling.

Third, there is a need for conducting qualitative research into how college students are using digital technologies and learning strategies in the classroom and individual learning to enhance their employability, as well as into which technologies and strategies they are using. Additionally, it is necessary to explore the success or barrier factors in using learning strategies through focus group interviews or behavioral event interviews of distinguished graduates exhibiting high core competencies and employable skills.

Finally, this study does not examine the differences between and moderating effects of the variables of the learner characteristics of college students, which include gender, major, types of college, and learner characteristics such as learning style, self-efficacy, and achievement goal orientations on the research model. Therefore, it is necessary to conduct follow-up research such as an investigation into the relationship and effects between measurement variables, analysis of variance (ANOVA) by measurement variables, and multi-group analysis of the research model according to characteristics of college students.

7. Conclusion

This study identified a significant effect that core competency has upon employability, while learning strategy has a mediating role in the influence of core competence on employability; digital literacy was not mediated. However, digital literacy was significantly mediated through learning strategy on the influence of core competence on employability. These findings suggest that college students need to develop learning strategies for themselves or participate in structured programs provided by their colleges to make effective use of learning strategy for their learning. Also, because learning strategy may be a catalyst for digital literacy, it is necessary to consider how students utilize digital devices and resources in their learning strategies for lectures and projects. It is necessary to conduct follow-up research such as experimental and quasi-experimental research to verify the relationship and influences between related variables, as well as the effect of core competencies on employability according to learners' characteristics such as gender, major, learning styles, achievement goal orientations, and qualitative studies.

Such follow-up research may be conducted through group interviews or behavioral event interviews for distinguished graduates who use effective learning strategies related to digital tools and technologies.

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