

Core Competencies Development among Science and Technology (S&T) College Students and New Graduates

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Abstract Employers and societies increasingly ask for competent and ready to work graduates, endowed with a certain amount of capabilities and competencies when entering the workforce. Whereas the need for highly skilled worker has been climbing, the discrepancy between competencies of graduates and qualifications searched by employers continue to be a serious concern among various nations [1,24]. The main issue addressed by the present study is: “Is science and technology (S&T) students and new graduates’ development of core competencies influenced by their prior perception of importance of these competencies? And does the development of these core competencies guarantee their fitness for purpose in terms of entering into the workforce?” Findings revealed that S&T students and new graduates’ experience at the institution have developed all the seven core competencies under investigation in the present research and that the development of core competencies is not always influenced by prior perception of importance. With respect to the fitness for purpose, findings show that S&T students and new graduates perceived their preparedness for the workplace close to “more than adequate preparation for being an expert in my field of S&T”. This finding confirms the view of “fitness for purpose” explanation as a requirement of the higher education.

Keywords: Korea, students, competencies, core competencies, science, technology, employers

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1. Introduction

The development of graduate competencies has been a topic of interest in the higher education literature among OECD [26]. Employers and societies increasingly ask for competent and ready to work graduates, endowed with a certain amount of capabilities and competencies when entering the workforce. Immense is the responsibility of higher education institutions, and quality of the outcomes is regarded as critical. Lindsay [16] observes that the quality of the outcome has been sized up in many different manners, namely against educational policy, against institutional mission, against impact on research and against the extent to which particular attributes were developed amongst graduates themselves. Particular attributes developed will be our area of focus. Bath et Al [3] identified three factors that have influenced the growing importance of graduates’ attributes, which are the perspective of education as lifelong process, the focus on employability of graduates and the development of outcome measures to justify the quality of higher education. Our study is concerned with competencies needed by new graduates in the field of science and technology (S&T) when entering the workforce.

Whereas the need for highly skilled worker has been climbing, the discrepancy between competencies of

graduates and qualifications searched by employers continue to be a serious concern among various nations [1,24]. Survey of the Federation of Korean Industries (2006) shows that almost 52% of Korean employers were not satisfied with the competencies of college graduates. Also, the deficiency in skilled labors was seen as a critical issue in the science and technology’s area, whence the need for universities to develop curriculum exhibiting the needs of the society and jobs’ needed skills [1]. Literature on businesses’ perspectives reveals, generally, that soft skills are as important if not more important requirements for employment and success in work as job specific skills [6,7,8,11,28,40,41]. The concept of competencies used in this study is that of core competencies. This concept is perceived as relevant for the present study and could be defined as the prevalent skills, knowledge, attitudes and abilities that people need to be successful in any kind of job [14,35]. The seven core competencies conceived by Oh & Lee [27] were perceived appropriate by both the business side and the faculty and are in line with the previous studies on competency models illustrating the needed skills for the Korean workforce [17].

2. Research Question

The main issue addressed by the present study is: “Is science and technology (S&T) students and new

graduates' development of core competencies influenced by their prior perception of importance of these competencies? And does the development of these core competencies guarantee their fitness for purpose in terms of entering into the workforce?" As it is assumed that college students generally start job-hunting from their third year or during their fourth year, only students on their third or fourth year as well as new graduates will be included in our study.

The initial stage of the present research is to assess S&T students and new graduates' perception of core competencies importance and find out whether there is a gap between Korean employers and students' views on the most important competencies. The next stage, which is the main part of our study, is to discover whether S&T students and new graduates' experience at the institution have developed their core competencies (employers' desirable core competencies) and whether the development of these competencies is influenced by their prior perception of importance of these competencies; also discovering from whom the students think they learned to develop these competencies is under investigation. In addition, one objective of the higher education being to make students ready for the job market, the study will strive to find out the students' own perception of the "fitness for purpose" in terms of entering the workplace, and whether the development of core competencies influence the perception of preparedness for the workplace.

3. Literature Review

3.1. Competency

The definition and the use of the term competency differ from one organization to another depending on the purpose and use of the competency described [15]. Competency was first initiated by Selznick in 1957, but since David McClelland [21] study entitled "Testing for competency rather than "intelligence"" started the development of the concept across several disciplines. The involvement of a large number of experts and researchers on the topic has produced sometimes conflicting views, hence the various definitions of the same concept. Boyatzis [5] and Spencer & Spencer [36] defined competency as an underlying characteristic of an individual that is causally related to the achievement of an effective or superior performance in a job. According to Rychen & Salganik [33], competency is the potential to successfully meet complex demands in a specific context through the mobilization of psychological prerequisites. Whereas Ulrich et al. [38] viewed competency as skills, abilities, knowledge and traits required for effective job performance, Woodruffe perceives competencies as a set of behaviors that a person must display in order to be competent. For its part, Parry [29] describes competency as a cluster of interconnected knowledge, skills and attitudes that influence a significant part of one's crucial responsibilities or roles; correlate with the work performance; can be quantified against well-accepted standards. A common point among all these definitions is the view of competency as ability for job or task performance.

For its part, the OECD's view of competency (2005) stretches the initial definition to incorporate global life

skills for fulfilling tasks in the society. According to OECD DeSeCo Project [26], competency is more than knowledge and skills, and necessitates the potential to meet complex demands, by relying on and deploying psychological resources in a specific context. The DeSeCo project's conceptual framework for key competencies consists of three categories. First the effective use of tools such as information technology and the use of knowledge, second the capacity to interact in heterogeneous groups and third the capacity to act autonomously.

3.2. Core Competency

The concept of core competency (or key competency), being in agreement with the aforementioned OECD DeSeCo definition have been mostly used as representing the primary aptitudes (or abilities) that an individual must carry in order to be successful in diverse life work [14]. Though described as fundamental abilities, core competencies prove to be pertinent to the job specific competencies in so far as job specific competencies share conventional features that are relevant both to jobs associated tasks and to the private and social life of the individual [17]. Specifically, this means that anyone with significant amount of core competencies will succeed not only in his personal life but in his career as well. For his part, So [35] views core competencies as not only encompassing context specific skills, but also social and behavioral aspects such as value, motivation, attitude which are imperative for individuals to execute tasks in different situations. According to Mayer [20], key competencies have also been known as 'generic skills', 'transferable skills' or 'underpinning skills'. Kim & al [14] in their study on life competency uncovered four necessary skills for a living a successful life. These skills are key skills, basic literacy, citizenship and job specific skills, and among them, key skills can be construed as core competency [27]. They defined Key competency as the most essential skills crucial for both personal and social life and a successful performance in one's career, and include communication skills, self-directed learning skills, problem solving skills, leadership.

3.3. Employers and Students' View on Competencies Importance

The unit of analysis though being students and new graduates, the current study attaches great importance to the views of employers on important competencies for students when entering the workforce. Harvey et al [9] contend that employers want workers who can readily fit into the workforce (adaptive), use their initiative to develop new ideas (adaptable), and help the organization progress by inspiring others and leading changes (transformative). The literature advocates that employers want new graduates that are competent and equipped with both cognitive and behavioral skills. Also, for educational institutions to produce employers' desirable competencies among graduates, it is crucial to have an awareness of particular skills desired by the workplace.

Coll and Zegwaard [6] investigate all the key science and technology stakeholders' (employers, students, new graduates, and faculty) expectation of competencies required of new graduates entering the workforce and compared their findings with similar studies on their

business counterparts [32]. Participants were asked to appraise the importance of a list of twenty-four competencies using a seven-point Likert scale. Overall, all the competencies were perceived as important by different stakeholders, and *ability and willingness to learn* was viewed as the single most important competence in the workplace. However, science and technology stakeholders place sizable prominence on cognitive skills. Students rating of overall importance of cognitive and behavioral skills are same, while recent graduates perceived cognitive skills as more important. Meanwhile, science and technology employers perceived behavioral skills less important than cognitive skills. As employers, faculty perceived cognitive skills to be more important. Of their sides, Hodges and Burchell [11] investigate New Zealand employers' opinion on the performance of graduates working in business position, and whether there is a gap between their performance and the importance they attribute to the competencies. Using a questionnaire survey, employers were requested to assess the level of importance they attributed to 25 competencies for bachelor level graduates in business roles in their first year of work. Also, employers were asked to rate the level of performance displayed by graduates for each competency. As for previous study, graduates' ability and willingness to learn was considered to be the most important competence, however unlike science and technology employers, business employers perceive soft skills more important than cognitive skills. Although the study reveals that employers were generally satisfy with the performance of the new graduates, the existing gap between the performance and importance rate suggests that employers' expectations of graduates in business role are not being met by graduate performance.

Nguyen, Yoshinari, Shigeji [25] investigate the perception of students in engineering fields on the needs of Japanese employers in terms of the personal qualities of higher education graduates. The employers' requirements of graduates were divided into two main categories. The first category group consists of knowledge of speciality, including qualifications and degrees, and the second category requires employable personal qualities, including personal skills, attitudes and traits. As the main focus of Japanese universities is knowledge speciality, personal qualities (consisting of 23 skills) that are said to have been neglected were the target of their study. The research revealed that Japanese students are aware of employers' expectations. The fact that they underestimate most of their personal abilities may be due to lack of self-confidence but also give signals for improvement to higher education institutions in these areas. The study also revealed that part-time jobs experience and university friends have more influence on students' development of personal qualities than traditional sources such as faculty and parents.

Oh & Lee [27] investigated the perceptual differences of core competencies between business sectors and the higher education in Korea. A list of seven core competencies that are the most important for college students was identified based on literature reviews on competency and business needs, and the content analysis of focus group interviews with professors from a large scale university. The main purpose of the study was to scrutinize the nature of the discrepancy between higher

education and business needs by examining how competencies valued at universities are considered at the actual workplace. Also, their study investigated core competencies perceived as the most important by asking both the workplace and the faculty to rank the two most important. Findings reveal that both workplace and professors perceived all the seven core competencies as appropriate, however both group differed in their view of most important core competencies. While faculty perceived professional knowledge (Basic theory and practical knowledge) and creativity (Novelty, adaptability) as the most important core competencies, the workforce views social skills (Communication, collaborative work skills, openness) and value & attitude (Respect for community, ethics, consideration of others) as the most desirable core competencies. Our study being structured around Korean employers' desirable core competencies for new graduates, the seven core competencies are used as basic framework for the present research.

3.4. Research on Competencies Development in Higher Education & Fitness for Purpose View

The development of graduates' competencies is a very important issue which is central to any higher education institution. Indeed, numbers of governments (especially in the UK, Canada and Australia) have made public funding partly dependent on verifiable graduates' outcomes, with a special attention on the production of 'work ready' graduates who are competent within their field of study and own the capacities needed to negotiate a world of work that is in continual mutation [2].

Indeed, in-depth Interviews with Spanish employers revealed that universities' graduates are expected to bring higher added values to the company as compared to those without higher education. The belief is that higher education equip individuals with a stronger knowledge base and, accordingly, intellectual potential and analytical skills that allow for quicker assimilation and learning of new knowledge [10]. The Spanish employers also emphasized the important teaching role of university, thus favoring the development of intellectual capacities, the absorption of discipline specific knowledge.

Warn & Tranter [39] examined the extent to which the development of generic competencies in graduates predicts their perception of the overall quality of their degree and the fitness for purpose of their degree for entry into the workforce. Two important qualities of the higher education system being its transformative function and its capacity to prepare students for the workplace [9], students are expected to develop generic competencies while attending higher education institutions, which later on will enable them to be employed. Then, Warn & Paul perceived the fitness for purpose explanation as the requirement of higher education to develop generic competencies [39]. The seven key competencies of Mayer [30] were used in their study, and data consisted of graduates' self-evaluation on their own accomplishment on a scope of competency.

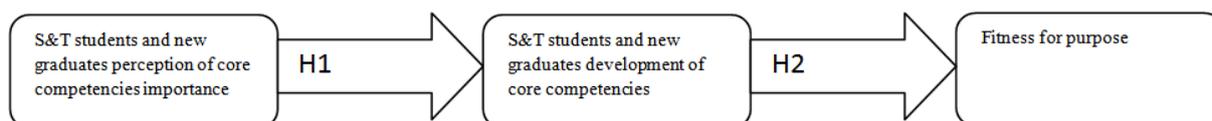
Moreover, while the need for highly competent worker has been rising, the discrepancy between competencies of graduates and qualifications searched by employers continue to be a serious concern among various nations [1,24]. On the one hand, universities have been criticized

about their incompetence to nurture workplace desirable skills into individuals. The attention given to soft skills by the business world act as a signal for higher education institutions, stressing the need to develop core competency suitable for diverse jobs in the long term, rather than education just centralized on field-specific theoretical and practical knowledge. On the other hand, complaints relate to the insufficiency of practical knowledge in higher education. Students, though equip with certain amount of theoretical knowledge, sometimes missed the applicability of content learned at the university, hence the deficient improvement of certain basic abilities while on the workplace [10]. However, the deficiency is less remarkable in technology field of study, due to the important role of theoretical knowledge.

4. Theoretical Argument

Overall, the literature on competencies development among college students and new graduates contends that higher education institutions have the responsibility to develop workplace desirable competencies [10,24,39]. Higher education adds value by the development of core

competencies that qualify students for the world of work, and allows students to be adaptive, adaptable and transformative [39]. Numbers of studies have investigated higher education stakeholders' (students, new graduates, employers, and faculty) perception of relative importance of competencies for graduates entering the workforce. However, no study has tried to assess whether the development of core competencies among students and new graduates in the field of science and technology is influenced by their prior perception of importance of these core competencies. Indeed, Coll, Zegwaard & Hodges [7,8] argued that "it is unlikely that tertiary institution will be able to instill particular competencies into students, if students fail to see the importance of for example, communication skills". In other words, it means that students' prior perception of importance while playing a critical role, determine the development of core competencies. Research in science education and education has proved that teaching students is remarkably influenced by students' prior perception [30]. Our study tries to empirically find out whether prior perception of core competencies' importance determines the development of these core competencies.



H1: S&T students and new graduates development of core competencies is influenced by their prior perception of these core competencies' importance:

- H1a: *Development of professional knowledge* is influenced by prior perception of *professional knowledge importance*.
- H1b: *Development of learning ability* is influenced by prior perception of *learning ability importance*.
- H1c: *Development of creativity* is influenced by prior perception of *creativity importance*.
- H1d: *Development of critical thinking* is influenced by prior perception of *critical thinking importance*.
- H1e: *Development of social skills* is influenced by prior perception of *social skills importance*.
- H1f: *Development of leadership* is influenced by prior perception of *leadership importance*.
- H1g: *Development of value and attitude* is influenced by prior perception of *value and attitude importance*.

H2: S&T students and new graduates' perception of their preparedness for the workplace is influenced by the development of core competencies during their higher education.

chosen in this student survey because of its low cost and ease of utilization. For the purpose of the present study, only S&T majors in bachelor programs, full time student in their 3rd year or 4th year and new graduates (an year and less) were included in our distribution list. The students were asked to use a five-point Likert scale to indicate: how important they thought each of the core competencies would be for their future employment, and their evaluation of their development of these seven core competencies. For importance scale, "1" indicated "least important" and "5" indicated "most important". In evaluating their own development for each core competency, "1" indicated "poor development" and "5" indicated "Good development". The competencies were listed in random order on the instrument and included description for each of the seven competencies listed to clarify any student misunderstanding. In addition, respondents were asked to answer other questions in relation to the fitness for purpose, source of their core competencies development. The questionnaire also allowed for open-ended comments from students and new graduates, in cases for which their perception of importance and performance for a particular competency differed substantially (e.g., by two or more points).

5. Research Methodology

The sample consists of a limited number of Korea university college students in the field of science and technology, thus findings of this research will not be generalized.

5.1. Design of the Survey

The research study was of an empirical nature with a questionnaire being handed to students randomly met in the college of science. The questionnaire method was

5.2. Core Competency List

The list of seven core competencies used in the Oh & Lee [27] study entitled "a study on the perceptual differences about core competencies between higher education and business sectors" were used. The seven core competencies used in their study were selected based on the literature review on competency and the workplace needs in Korea and by the contents analysis of focus groups interviews with professors. These seven core competencies and their constituents are: *professional knowledge (basic theory and practical knowledge)*,

learning ability (self-directed learning, informational technology implementation skills, foreign language abilities), creativity (novelty, adaptability), critical thinking (higher order thinking, analytical and logical thinking), social skills (communication, collaborative work skills, openness), leadership (decision making, broad perspective, challenging attitude), values and attitude (respect for community, ethics, and consideration of others). This list of seven core competencies are perceived as being appropriate for both the workplace and the faculty, and is supported by past researches on competency models depicting necessary skills for the Korean workplace [13,17,22].

5.3. Administration of the Survey

The respondents comprised students and new graduates all specialized in S&T field of study and were from Korea University, a major university located in Seoul, Korea. The students were approached randomly met in the college of science, and in computer engineering department. However, the survey having been conducted during the final exam period, availability of students was an issue in the present study. Our sample consists of 22 students. The questionnaire being in English (with 26 questions), language issue represent often a concern for respondents. Before conducting each survey, in order to satisfy criterions of our research design, respondents were asked if bachelor students, in 3rd or 4th year and in the field of S&T.

6. Data Analysis

SPSS 20 was used to analyze our data. The first step of this research was to assess whether there is a gap between

S&T students and new graduates' perceptions and Korean employers' perceptions on the most desirable core competencies for the workplace. Indeed, previous study revealed that the Korean workplace prefers *social skills* for both the first and the second place [27]. Also, the competency most often ranked first other than *social skills* was *values and attitudes*. In our actual study, survey results of S&T students and new graduates of the three most valued competencies illustrate that for the first choice, *professional knowledge* and *learning ability* were equally chosen, and *values & attitudes* as second choice (See Table 1). The findings reveal an existing gap between Korean employers and S&T students and new graduates perception of the more important core competencies. Unlike Japanese students of the faculty of engineering [25], Korean S&T students seems not aware of the workplace most desirable core competencies. Our survey also asked respondents to rate on a five-point Likert scale the importance of each of the core competencies for their future employment. Rainbow et al [32] using a seven-point Likert scale, took a mean of less than four to indicate that respondents interpreted this such competencies as being unimportant. Our study, using a five-point Likert scale, less than three will be interpreted as unimportant. Results of this analysis (see Table 2) confirm students and new graduates' perception of *professional knowledge* and *learning ability* as the most important for S&T graduates entering the workforce. Indeed while the mean of importance of *professional knowledge* is 4.36, that of *learning ability* is 4.18 followed by *creativity* with a mean of 4.00. However, though the three most desirable core competencies are of cognitive nature, it is worth noting that all the seven competencies are perceived as important, each having a mean superior to three.

Table 1. 1st, 2nd and 3rd ranked competencies

Core Competencies	Participants (%)		
	1 st	2 nd	3 rd
Professional knowledge	6 (27.27%)	6 (27.27%)	2(9.09)
Learning ability	6 (27.27%)	0	0 (0%)
Creativity	2 (9.09)	2 (9.09)	8 (36.36%)
Critical Thinking	4 (18.18%)	4 (18.18%)	4 (18.18%)
Social skills	0 (0%)	2(9.09)	6 (27.27%)
Leadership	2 (9.09)	0	2 (9.09)
Values and attitude	2 (9.09)	8 (36.36%)	0 (0%)
Total	22 (100%)	22(100%)	22 (100%)

Table 2. Perception of competencies importance

	N	Mean	Std. Deviation
Professional knowledge importance	22	4,3636	,67420
Learning ability importance	22	4,1818	,75076
Creativity importance	22	4,0000	,77460
Critical thinking importance	22	3,8182	,98165
Social skills importance	22	3,3636	,80904
Leadership importance	22	3,4545	,82020
Values & attitudes importance	22	3,4545	1,29334

The next stage which is the main part of our research was to discover whether S&T students and new graduates' experience at the institution have developed their core competencies and whether the development of their core competencies were influenced by their prior perception of importance of these competencies. Results show that students and new graduates have developed all the listed

competencies while at the university (See Table 3). *Learning ability* and *professional knowledge* while perceived as the two most important competencies by S&T students and new graduates are those that have the most been developed by them. The average development mean of *learning ability* is 4, 36 and that of *professional knowledge* is 4, 09. On the other hand, *values and*

attitudes are the skills that have the less been developed among students and new graduates with a mean of 3, 45.

Our study tried to find out if the development of the core competencies is influenced by the prior perception of importance of these core competencies. Results of correlation analysis show that there is a significant relationship between *professional knowledge development* and *professional knowledge importance*, $r = .64$, p (one-tailed) $< .05$; *Social skills development* was significantly correlated with *social skills importance*, $r = .61$, p (one-tailed) $< .05$; *Leadership development* was significantly

related to *leadership importance*, $r = .70$, $p < .01$. On the other hand, *critical thinking development* was correlated with *critical thinking importance*, but the relationship was not significant ($r = .32$ and $p = .16 > .05$); *Values and attitudes development* was correlated to *values and attitudes importance*, but the relationship was not significant ($r = .39$ and $p = .17 > .05$). Whereas the correlation between *learning ability development* and *learning ability importance* was a very weak ($r = .07$ and $p = .41 > .05$), there was no relationship between *creativity development* and *creativity importance* ($r = .00$ and $p = .50 > .05$).

Table 3. Development of the core competencies

	N	Mean	Std. Deviation
Professional knowledge development	22	4,0909	,83121
Learning ability development	22	4,3636	,50452
Creativity development	22	3,6364	1,12006
Critical thinking development	22	4,0000	,63246
Social skills development	22	3,2727	1,19087
Leadership development	22	3,2727	1,67874
Values & attitudes development	22	3,0909	,70065

Findings of this research only support hypotheses H1a, H1e and H1f. Regarding H1a, the value of R^2 is .42, which tells us that the perception of *professional knowledge importance* can account for 42 percent of the variation in *professional knowledge development*. For our data, F-ratio is 6, 54, which is significant at $p < .05$. In other words, there is less than 5% chance than an F-ratio this large would happen if the null hypothesis were true. In short, the regression model overall predicts *professional*

knowledge development well (See Table 4). With regard to H1e, the coefficient of determination ($R^2 = .37$) tells us that 37% the variability of a *social skills development* can be explained by the perception of importance. The value of F is 5, 42 and is significant at $p < .05$. Our model results in a significantly good degree of prediction of the outcome variable (See Table 5). With respect to the H1f, ($R^2 = .49$), F-ratio is 8, 64 and is significant at $p < .05$ (See Table 6). Our model is a good predictor of *leadership development*.

Table 4. ANOVA

Model	Sum of Squared	Mean Square	F	Sig.
1 Regression	2,909	2,909	6,545	,031 ^b
Residual	4,000	,444		
Total	6,909			

a. Dependent Variable: The extent to which your experience at the higher education institution (or university) had developed your professional knowledge

b. Predictors: (Constant), Your perspective of importance of professional knowledge today

Table 5. ANOVA

Model	Sum of Squared	Mean Square	F	Sig.
1 Regression	5,335	5,335	5,427	,045 ^b
Residual	8,847	,983		
Total	14,182			

a. Dependent Variable: The extent to which your experience at the higher education institution (or university) had developed your social skills

b. Predictors: (Constant), Your perspective of importance of social skills today

Table 6. ANOVA

Model	Sum of Squared	Mean Square	F	Sig.
1 Regression	13,803	13,803	8,640	,017 ^b
Residual	14,378	1,598		
Total	28,182			

a. Dependent Variable: The extent to which your experience at the higher education institution (or university) had developed your leadership

b. Predictors: (Constant), Your perspective of importance of Leadership today

Table 7. Two most important sources from which each competence have been developed

Core Competency List	First	Second
Professional Knowledge	Univ.'s classes and Faculty Members: (81, 9%)	Internship activities: (36,4%)
Learning Ability	Univ.'s classes and Faculty Members: (63, 6%)	Internship activities: (36,4%)
Creativity	Internship activities: (45, 5%)	Univ.'s classes and Faculty Members: (54, 5%)
Critical Thinking	Univ.'s classes and Faculty Members: (58, 3%)	Part-time Jobs: (36, 4%)
Social Skills	Univ.'s clubs and other activities: (45, 5%)	Parents & Family members: (45, 5%)
Leadership	Friends: (36, 4%) Univ.'s clubs and other activities: (36, 4%)	Univ.'s classes and Faculty Members: (36, 4%) Univ.'s clubs and other activities: (36, 4%)
Values & Attitudes	Parents & Family members: (36, 4%)	Friends: (27, 3%) Parents & Family members: (27, 3%)

The present study uncovers the two most sources from which Korean S&T students and new graduates' core competencies have been developed (See Table 7). Most students (81, 9%) said to have developed their *professional knowledge* during university's classes or by the faculty members, the second source of *professional knowledge* development being internship activities. As *professional knowledge*, *learning ability* (63, 6%) and *critical thinking* (58, 3%) are said to have been firstly developed during university's classes or by the faculty members. *Creativity*'s first source of development is said to be internship activities (45, 5%), while its second source is university's classes and faculty members. With regard to more behavioral skills, the main sources of development appear to be other than academic ones. Whereas *social skills*' first source of development is university's clubs and other activities (45, 5%), the first source of *leadership* development are equally friends (36,

4%) and univ.'s clubs and other activities 36, 4%). Values and attitudes' first source of development is parents and family members (36, 4%).

S&T students and new graduates' own assessment of their preparedness for the workplace produced a mean of 3, 63, which is close to "better than adequate preparation", thus confirming that their institution prepared them for being or to become an expert in their field of science and technology. However, is students and new graduates' perception of their preparedness influenced by the development of the core competencies? Findings of the present research support hypothesis H2, and perceive the development of core competencies as influencing the perception of preparedness. Core competencies development was significantly correlated to Preparedness assessment, with $r = .63$, $R^2 = .40$ and p (one-tailed) $< .05$. F-ratio is 6, 09 and is significant at $p < .05$ (See Table 8). In short, the regression model overall predicts Preparedness well.

Table 8. ANOVA

Model		Sum of Squared	Mean Square	F	Sig.
1	Regression	3,451	3,451	6,096	,036 ^b
	Residual	5,095	,566		
	Total	28,182			

a. Dependent Variable: how would you evaluate your preparedness for being an expert in your field of science and technology?

b. Predictors: (Constant), Comp_Dvt_GI

7. Discussion and Conclusion

The very first step of the present research being to assess whether there is a gap between Korean employers and S&T students and new graduates' perception of the more important core competencies found a gap. Indeed, while Korean workplace perceives social skills for both the first and the second place [27], the present research show that S&T students and new graduates' first choice were equally professional knowledge and learning ability. This finding confirm the view of higher education as being the lieu of knowledge transmission but implicitly reveals the fact that some behavioral aspects, that are perceived as important for the workplace are sometime neglected. Higher education institutions should not only reveal to their students the workplace expectation, but develop behavioral skills that appear to be important for S&T new graduates' future career.

Higher education have the responsibility to develop workplace desirable competencies [10,24,39] and allow students to be adaptive, adaptable and transformative [39]. The present study revealed that S&T students and new graduates' experience at the institution have developed all the seven core competencies under investigation in the present research. *Learning ability* and *professional knowledge*, while being perceived as the most important competencies by S&T students and new graduates are those that have most been developed by them (See Table 3). This finding could serve as theoretical argument for further research on the relationship between perception of importance and development of competencies in higher education.

Regarding our research, findings show that the development of core competencies is not always influenced by prior perception of importance. Indeed, out of seven hypotheses supposed to confirm that the development of core competencies is influenced by prior

perception of importance, only three hypotheses were supported, H1a (*professional knowledge*), H1e (*social skills*) and H1f (*leadership*). It means that our the hypothesis H1 cannot be generalized, thus the prior perception of core competencies' importance does not determine the development of these core competencies. With reference to the source from which students think they learned to develop the core competencies, the present study reveals that for professional knowledge, *learning ability* and *critical thinking* the first source is university's classes and faculty members. For behavioral competencies, such as social skills, leadership and value & attitudes, first sources are university's clubs and other activities, friends and parents and family members, respectively (See Table 7).

With respect to the fitness for purpose, the study show that S&T students and new graduates perceived their preparedness for the workplace close to "more than adequate preparation for being an expert in my field of S&T". This finding confirms the view of "fitness for purpose" explanation as a requirement of the higher education. Warn & Tranter [39] finding is confirmed by the present study, thus students and new graduates' perception of their preparedness for the workplace is influenced by the development of core competencies during their higher education.

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