Validation of a Diagnostic Model for Core Competencies at the Higher Education Institute in Korea

Sung-Wan Kim*

Abstract

The purpose of this study is to develop and validate a model for diagnosing core competencies at the higher education level. Based on literature reviews, a potential model for core competencies at university was suggested. A tool for validating the model was composed of 24 items, which were delivered to 226 professors and administrative staffs, 730 students, and 134 graduates & external industrial experts. Five constructs (core competencies) were extracted from the data collected among professors and administrative staff responding to the importance of the items. The results of importance and performance surveys on core competencies with students were respectively 3.28 to 3.66 and 2.68 to 3.28 (4-point Likert scale). Statistical differences between importance level and performance level were found in all the sub-categories of core competencies. Borich priority determination formula and Locus for Focus Model were used for the determination of the priority of needs. Importance survey among graduates and external experts showed that the mean of each items ranged from 2.80 to 3.76 (4-point Likert scale). The overall results of the analyses suggest that the final model is appropriate for measuring the core competencies.

Keyword: Core Competencies, Validation, Higher Education, Diagnostic Model

I. Introduction

Over the past decade, interest in core competencies has risen more than ever in governments, businesses, primary and secondary schools and universities in Korea. The Korean government has introduced national competency standards (NCS), which systematizes learning contents including knowledge, skills, and attitudes required to perform tasks at industrial sites. Since then, companies have been utilizing NCS in the development and optimization of human resources and management plans and have also applied an NCS-based curriculum centered on junior colleges. These series of trends have focused on developing key competencies that are relevant to a specific job. However, core competencies in primary & secondary education and college education need to focus more on generic or common competencies required by all jobs, rather than those related to specific jobs [1].

The 2015 revised Korean national curriculum for elementary and secondary education focused on fostering basic competencies and job skills needed by future society and industrial society. It also reflected the NCS-based curriculum, and the six core competencies (self-management competency, knowledge/information processing competency, creative thinking competency, aesthetic emotional competency, communication competency, and civic competency) [2]. The first competency self-management is the ability to lead a self-directed life with personal identity
and confidence, along with basic abilities and qualifications necessary for life and career. The second competency knowledge/information processing is the ability to process and utilize diverse knowledge and information in order to solve problems rationally. The third competency creative thinking is the ability to create new and useful things by fusing knowledge, skills, and experiences from various specialized fields on the basis of broad foundations knowledge. The fourth aesthetic emotional competency is the ability to discover and appreciate the meaning and value of life, based on empathetic understanding of the world and cultural sensitivities. The fifth competency communication is the ability to express one's thoughts and feelings effectively in various situations, to communicate with others and to adjust to conflicts. The last civic competency is the ability to actively participate in community development with values and attitudes required for membership in local, national, and global communities.

The need for core competencies in higher education has been linked to criticism regarding the quality of higher education. Most certificates and overall scores obtained in higher education are not comparable across institutions and do not offer reliable and valid indication of the skills and knowledge students acquire over the course of their studies [3]. According to research [4] on excellent students who received A + from S University in Korea, the secret to achieving high scores was through passive attention to instructor's lectures rather than through the expression of creative opinions. Results reveal that the system of evaluating student's achievements focuses much more highly on how much content is remembered than which skills are improved through the lesson.

Early researches on core competencies in higher education focused on the conceptual debate on competency [5][6], the development of core competency [7], empirical case studies [8], and the general framework for competency assessment components [9]. Such research has the following limitations: First, there is a substantial lack of research on measurement models and valid methods of competency assessment in higher education [10]. In particular, accredited institutions of higher education lack sufficiently reliable and valid methods of measuring students’ competencies [11]. Second, prior researches has not reflected a variety of participants’ opinions. The collected data included mainly professors and students, and did not consider other important stakeholders such as graduates and industrial experts who were directly related with the core competencies. Third, various statistical methods were used to derive core competencies, but content validity was more important than statistical construct validity. Therefore, reliable and valid research assessing competencies in higher education is needed, taking into consideration stakeholders’ opinions in higher education as well as statistical approaches. The purpose of this study is to develop and statistically validate the core competencies in higher education, reflecting a variety of stakeholders’ opinions. The research questions are: What is the potential model of the core competency in higher education? And is the potential model statistically valid?

II. Core Competencies in Higher Education

The OECD's DeSeDo project report (2005) [12] has become a critical starting point for discussions on core competencies to prepare for the future. This report describes the core competency as "the ability to produce valuable outcomes on a personal or social level in order to maintain an individual's successful life and a happy society. It is also the ability to use cognitive and practical skills as well as social and behavioral factors such as attitudes, feelings, values and motives to successfully meet the complex needs of a particular context. This report categorizes the core competencies into three sub-categories (i) ability to interactively use tools such as language, symbols, and evaluations; (ii) ability to interact with heterogeneous groups to smoothly engage with others and to work and collaborate within a team; and, (iii) ability to manage and resolve conflicts to act in a large context and to establish and fulfill life plans and personal projects.

Trilling and Fadel (2009) [13] divided 21st century competencies into learning and innovation skills, digital literacy skills, and career & life skills. Learning and innovation skills include critical thinking and problem solving; communication and collaboration; as well as creativity and innovation. Digital literacy skills consist of information literacy, media literacy, and information and communication technology (ICT) literacy. Career and life skills include flexibility and adaptability; initiative and self-direction; social and cross-cultural interaction;
Table 1. Models of Core Competencies in Higher Education

<table>
<thead>
<tr>
<th>Core Competency</th>
<th>K-CESA</th>
<th>Dong Kuk Univ.</th>
<th>Sungkyunkwan Univ.</th>
<th>ATELLO</th>
<th>NPEC</th>
<th>CLA</th>
<th>ACT</th>
<th>Univ. of Sydney</th>
<th>Univ. of Queensland</th>
<th>Alverno Univ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem solving</td>
<td>Creative thinking skill</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Critical thinking skill</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Information literacy</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<td>○</td>
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<td>○</td>
</tr>
<tr>
<td>Communication</td>
<td>Communication skill</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Collaboration skill</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Empathy ability</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Self-direction</td>
<td>Leadership</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Learnability</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Globalization ability</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Co-existence</td>
<td>Rehabilitation ability</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Social service ability</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Multiculture ability</td>
<td>○</td>
<td>○</td>
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<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

The results analyzing and synthesizing core competencies of higher education institutes are as follows. Problems solving competency includes creative thinking skills, critical thinking skills, and information literacy. The University of Queensland’s core competency is composed of effective communication, critical judgment, and independence and creativity. The Alverno College specifies eight abilities: communication, analysis, valuing in decision-making, problem solving, developing global perspective, social interaction, effective citizenship and aesthetic engagement.

K-CESA (Korea Collegiate Essential Skills Assessment), a core competency model for college students developed by the Korea Research Institute for Vocational Education & Training, consists of communication, comprehensive reasoning, utilization of resources, information & technology, global readiness, self-management, and interpersonal relationship. Dongguk University’s core competency is composed of communication, self-development, interpersonal relationship, globalization, ICT utilization, problem solving. Sungkyunkwan University specifies that its competencies are communication, humanitarian capacity, academic skill, globalization, creativity, and leadership.

As shown in Table 1 above, the results analyzing and synthesizing core competencies of higher education institutes are as follows. Problems solving competency includes creative thinking skills, critical thinking skills, and information literacy. Communication competency consists of clear communication skill, collaboration skills, and empathy. Self-direction competency is composed of leadership, learning ability and global ability. Finally, co-existence competency can be divided into rehabilitation ability, social service ability, and multicultural ability.

### III. Method

#### 1. Participants

The surveys on the importance of diagnostic items
were conducted among 226 professors and administrative staffs, 730 students, and 134 graduates and external experts. Details of participants are shown in Table 2.

![Table 2. Questionnaire Participants Information](image)

### 2. Instrument

Based on a review of academic articles and official reports related with vision and development strategies of universities, the potential model consisting of 4 core competencies and 12 practical abilities, was developed ([Fig. 1]).

![Fig. 1 Potential model of core competencies at a higher education institute](image)

In order to verify the validity of this potential model, 24 items were derived for each practical ability based on the model. Additionally two professors in education and one professor in special education revised and supplemented the items through face-to-face meetings (<Table 3>).

### 3. Procedures

Aiming to develop a potential model of core competencies in higher education and to validate the model, a framework was derived based on the literature review. It includes four competencies (problem solving, communication, self-direction, and co-existence), and 12 practical abilities (creative thinking, critical thinking,
information literacy, communication, collaboration, empathy, leadership, learnability, globalization, rehabilitation, social service, multi-culture).

For the purpose of collecting data to validate the derived potential model, 24 evaluation items (4-point Likert scale) were developed. The survey on the importance of core competencies was carried out with professors and administrative staffs (226 persons). After conducting the survey, an exploratory factor analysis was conducted to derive a revised model using collected data. In order to further validate the revised model of core competencies, an importance-performance assessment survey was conducted among 730 students and another survey was carried out to evaluate the importance of core competencies among graduates and external experts (134 persons).

4. Data Analysis

In this study, a frequency analysis and an exploratory factor analysis on the data collected through the survey with professors and administrative staffs were carried out in order to derive the core competencies. Data collected through the survey among students were analyzed through frequency analysis, Wilcoxon’s sign rank test, Borich priority determination formula, and Locus for Focus model analysis. And frequency analysis was performed for examining the responses of graduates and external experts.

<table>
<thead>
<tr>
<th>Core Competency</th>
<th>Item</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Solving</td>
<td>A1</td>
<td>3.61</td>
<td>.58</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>3.65</td>
<td>.56</td>
</tr>
<tr>
<td></td>
<td>A3</td>
<td>3.57</td>
<td>.59</td>
</tr>
<tr>
<td></td>
<td>A4</td>
<td>3.51</td>
<td>.63</td>
</tr>
<tr>
<td></td>
<td>A5</td>
<td>3.26</td>
<td>.70</td>
</tr>
<tr>
<td></td>
<td>A6</td>
<td>3.32</td>
<td>.69</td>
</tr>
<tr>
<td>Communication</td>
<td>B1</td>
<td>3.62</td>
<td>.59</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>3.63</td>
<td>.57</td>
</tr>
<tr>
<td></td>
<td>B3</td>
<td>3.76</td>
<td>.50</td>
</tr>
<tr>
<td></td>
<td>B4</td>
<td>3.78</td>
<td>.51</td>
</tr>
<tr>
<td></td>
<td>B5</td>
<td>3.54</td>
<td>.60</td>
</tr>
<tr>
<td></td>
<td>B6</td>
<td>3.48</td>
<td>.65</td>
</tr>
</tbody>
</table>

Table 4. Mean and Standard Deviation for Items

As shown in Table 4, the mean of each evaluation item ranged from 3.21 to 3.76. It means that 24 items were considered to be of significant importance for a successful university life. An exploratory factor analysis was conducted by using the data collected through the survey among professors and administrative staffs.

The correlation between the items was not high. The correlation between the items and the total score was more than .3 in all 24 items. As a result of examining the KMO value and the Bartlett test, it was found that there was a common factor (KMO = .924, p = .000) among the collected data. Therefore, exploratory factor analysis was performed. In order to determine the number of common factors, Kaiser criterion, scree test, and interpretability were considered, and the number of factors for extraction was set to five (Table 5). The first five factors accounted for 63.74% of the total variance.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Difference of eigenvalue</th>
<th>Variance explained (%)</th>
<th>Cumulative variance explained(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.407</td>
<td>8.845</td>
<td>43.363</td>
<td>43.363</td>
</tr>
<tr>
<td>2</td>
<td>1.559</td>
<td>.366</td>
<td>6.496</td>
<td>49.858</td>
</tr>
<tr>
<td>3</td>
<td>1.193</td>
<td>.071</td>
<td>4.972</td>
<td>54.831</td>
</tr>
<tr>
<td>4</td>
<td>1.122</td>
<td>.105</td>
<td>4.677</td>
<td>59.508</td>
</tr>
<tr>
<td>5</td>
<td>1.017</td>
<td>.426</td>
<td>4.236</td>
<td>63.744</td>
</tr>
</tbody>
</table>

Table 5. Relative Importance and Explanation Ratios by Factor

After determining the number of factors, a principal component factor analysis and the Varimax rotation method were adopted. The results of the exploratory factor analysis

IV. Results

In this section, the results of the questionnaire survey for the purpose of deriving core competencies and validating them will be presented. Also, the results of the evaluation of the related groups (students, graduates, external experts) on the developed core competencies will be described.

1. Developing and Validating a Model for Core Competencies at University

In order to confirm the validity of the potential model for the university’s core competencies, a survey consisting of 24 evaluation items was conducted. Using data collected from professors and administrative staffs (226 persons), frequency analysis and exploratory factor analyses were performed. The results are shown below.
are shown in (Table 6) below. The items were roughly clustered into five categories: problem solving (factor 1), information communication (factor 2), social relationship (factor 3), innovative learning (factor 4), as well as care and co-existence (factor 5). The internal consistency reliability was analyzed to test the correlation among items. The Cronbach alpha for the diagnostic model of core competencies was .94, which confirmed the adequacy of the internal consistency of the model.

Table 6. Result of Factor Analysis for 5-Factor Model (Model I)

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor I (Problem solving)</th>
<th>Factor II (Information &amp; Communication)</th>
<th>Factor III (Social relationship)</th>
<th>Factor IV (Innovative learning)</th>
<th>Factor V (Care &amp; co-existence)</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>.664</td>
<td>-.111</td>
<td>.255</td>
<td>.175</td>
<td>.135</td>
<td>.942</td>
</tr>
<tr>
<td>A2</td>
<td>.754</td>
<td>.089</td>
<td>.146</td>
<td>.140</td>
<td>.15</td>
<td></td>
</tr>
<tr>
<td>A3</td>
<td>.682</td>
<td>.290</td>
<td>.149</td>
<td>.241</td>
<td>.181</td>
<td></td>
</tr>
<tr>
<td>A4</td>
<td>.552</td>
<td>.589</td>
<td>.031</td>
<td>.110</td>
<td>.171</td>
<td></td>
</tr>
<tr>
<td>A5</td>
<td>.059</td>
<td>.734</td>
<td>.315</td>
<td>.183</td>
<td>.272</td>
<td></td>
</tr>
<tr>
<td>A6</td>
<td>.027</td>
<td>.683</td>
<td>.207</td>
<td>.301</td>
<td>.369</td>
<td></td>
</tr>
<tr>
<td>B1</td>
<td>.187</td>
<td>.433</td>
<td>.203</td>
<td>.596</td>
<td>-.075</td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>.402</td>
<td>.333</td>
<td>.354</td>
<td>.338</td>
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</tr>
<tr>
<td>B3</td>
<td>.361</td>
<td>.217</td>
<td>.686</td>
<td>.161</td>
<td>.063</td>
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</tr>
<tr>
<td>B4</td>
<td>.253</td>
<td>.161</td>
<td>.742</td>
<td>.185</td>
<td>.176</td>
<td></td>
</tr>
<tr>
<td>B5</td>
<td>.140</td>
<td>.089</td>
<td>.606</td>
<td>.346</td>
<td>.277</td>
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</tr>
<tr>
<td>B6</td>
<td>.126</td>
<td>.165</td>
<td>.581</td>
<td>.354</td>
<td>.289</td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>.255</td>
<td>.063</td>
<td>.291</td>
<td>.618</td>
<td>.162</td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>.435</td>
<td>.241</td>
<td>.237</td>
<td>.410</td>
<td>.430</td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>.162</td>
<td>.214</td>
<td>.211</td>
<td>.686</td>
<td>.307</td>
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</tr>
<tr>
<td>C4</td>
<td>.142</td>
<td>.118</td>
<td>.149</td>
<td>.776</td>
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<tr>
<td>C5</td>
<td>.237</td>
<td>.217</td>
<td>.211</td>
<td>.559</td>
<td>.346</td>
<td></td>
</tr>
<tr>
<td>C6</td>
<td>.284</td>
<td>.099</td>
<td>.175</td>
<td>.359</td>
<td>.506</td>
<td></td>
</tr>
<tr>
<td>D1</td>
<td>.080</td>
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<td>.586</td>
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<td>.470</td>
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<tr>
<td>D2</td>
<td>.005</td>
<td>.245</td>
<td>.483</td>
<td>.116</td>
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</tr>
<tr>
<td>D3</td>
<td>.205</td>
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<td>.426</td>
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<td>.544</td>
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<tr>
<td>D4</td>
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<td>.154</td>
<td>.295</td>
<td>.170</td>
<td>.672</td>
<td></td>
</tr>
<tr>
<td>D5</td>
<td>.138</td>
<td>.135</td>
<td>.160</td>
<td>.157</td>
<td>.763</td>
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</tr>
<tr>
<td>D6</td>
<td>.204</td>
<td>.249</td>
<td>.015</td>
<td>.194</td>
<td>.743</td>
<td></td>
</tr>
</tbody>
</table>

Eigenvalue 1.122 1.017 1.559 1.193 10.407

Variance Explained (%) 4.677 4.236 6.495 4.972 43.363

Cumulative Proportion of total variance (%) 4.677 8.913 15.408 20.38 63.744

The second exploratory factor analysis, which was carried out again by each factor as separate factor analysis, was conducted to derive sub-factors (practical ability) for each factor (core competency). In result, a two-factor model (Model II) (Table 7), a two-factor model (Model III) (Table 8), a two-factor model (Model IV) (Table 9), a three-factor model (Model V) (Table 10), a three-factor model (Model VI) (Table

11) were also suggested, as the factors from each models accounted for 76.7%, 82.8%, 81.2%, 79.6%, and 81.5% of the model variance, respectively.

Table 7. Result of Factor Analysis for 2–Factor Model (Model II)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Item</th>
<th>Factor II–1 (creative thinking)</th>
<th>Factor II–2 (critical thinking)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem solving</td>
<td>A1</td>
<td>.901</td>
<td>.123</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>.726</td>
<td>.394</td>
</tr>
<tr>
<td></td>
<td>A3</td>
<td>.355</td>
<td>.763</td>
</tr>
<tr>
<td></td>
<td>A4</td>
<td>.133</td>
<td>.895</td>
</tr>
</tbody>
</table>

Eigenvalue 2.331 .738

Variance Explained (%) 58.268 18.440

Cumulative Proportion of total variance (%) 58.268 76.708

Table 8. Result of Factor Analysis for 2–Factor Model (Model III)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Item</th>
<th>Factor III–1 (information utilization)</th>
<th>Factor III–2 (communication)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social relationship</td>
<td>A5</td>
<td>.913</td>
<td>.194</td>
</tr>
<tr>
<td></td>
<td>A6</td>
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<td>.859</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>.195</td>
<td>.869</td>
</tr>
</tbody>
</table>

Eigenvalue 2.415 .898

Variance Explained (%) 60.373 22.457

Cumulative Proportion of total variance (%) 60.373 82.830

Table 9. Result of Factor Analysis for 2–Factor Model (Model IV)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Item</th>
<th>Factor IV–1 (Collaboration)</th>
<th>Factor IV–2 (Empathy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social relationship</td>
<td>B3</td>
<td>.897</td>
<td>.237</td>
</tr>
<tr>
<td></td>
<td>B4</td>
<td>.815</td>
<td>.373</td>
</tr>
<tr>
<td></td>
<td>B5</td>
<td>.284</td>
<td>.846</td>
</tr>
<tr>
<td></td>
<td>B6</td>
<td>.286</td>
<td>.839</td>
</tr>
</tbody>
</table>

Eigenvalue 2.620 .826

Variance Explained (%) 65.508 15.648

Cumulative Proportion of total variance (%) 65.508 81.156

Table 10. Result of Factor Analysis for 2–Factor Model (Model V)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Item</th>
<th>Factor V–1 (Learnability)</th>
<th>Factor V–1 (Innovation)</th>
<th>Factor V–2 (Globalization)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovative learning</td>
<td>C1</td>
<td>.265</td>
<td>.878</td>
<td>.278</td>
</tr>
<tr>
<td></td>
<td>C2</td>
<td>.716</td>
<td>.458</td>
<td>-.030</td>
</tr>
<tr>
<td></td>
<td>C3</td>
<td>.670</td>
<td>.301</td>
<td>.361</td>
</tr>
<tr>
<td></td>
<td>C4</td>
<td>.805</td>
<td>.268</td>
<td>.244</td>
</tr>
<tr>
<td></td>
<td>C5</td>
<td>.732</td>
<td>-.012</td>
<td>.503</td>
</tr>
<tr>
<td></td>
<td>C6</td>
<td>.220</td>
<td>.260</td>
<td>.885</td>
</tr>
</tbody>
</table>

Eigenvalue 3.556 .561

Variance Explained (%) 59.301 10.631

Cumulative Proportion of total variance (%) 59.301 68.991 79.623
The final model for the analysis of university’s core competencies consists of five areas: problem solving, information and communication, social relation, learning innovation, as well as care and co-existence. Each core competency has two or three practical abilities. The problem-solving competency is based on creative thinking and critical thinking. The information and communication competency is related to information literacy and communication ability. The social relationship competency includes cooperative ability and empathy. The learning innovation competency consists of learnability, innovation and globalization. Finally, the care and co-existence competency includes rehabilitation, social service, and multi-culture. Based on the aforementioned results, the final revised criteria model is shown in <Figure 2>.

2. Analysis of Importance–Performance Student Survey on Derived Core Competency

A survey on the importance and performance of the core competency evaluation items was conducted in order to gather students’ opinions (730 persons) regarding the competencies which were derived through an exploratory factor analysis. The analysis results are shown in Table 12 below.

As shown in the above table, the average scores for items (4-point Likert scale) in the importance evaluation ranged from 3.28 to 3.66, suggesting that students felt that the practical abilities of each core competency were
necessary factors for successful university life. The average scores for items (4-point Likert scale) in the performance evaluation ranged from 2.68 to 3.28, indicating the level of performance that students thought was relatively lower than the importance for their practical abilities of core competencies. Moreover, the Wilcoxon’s sign rank test for importance-performance difference analysis showed significant difference between importance and performance in all areas at significance level .01.

Furthermore, in order to prioritize practical abilities, the Borich priority determination formula (<Table 12>) and the Locus for Focus model analysis ([Fig. 3]) were conducted. Students regarded self-management, critical thinking, and support for people with disabilities as priorities (<Table 13>).

![Fig. 3. Priority determination of students' practical skills by analyzing Locus for Focus Model](image)

### Table 13. Prioritization of practical skills

<table>
<thead>
<tr>
<th>Borich Priority</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
</tr>
</thead>
<tbody>
<tr>
<td>C3 Self-management</td>
<td>A1 Creative thinking</td>
<td>D1 Professional service</td>
<td>D4 Supporting the handicapped</td>
<td>C4 Innovation</td>
<td></td>
</tr>
<tr>
<td>C3 Self-management</td>
<td>A1 Creative thinking</td>
<td>D2 Flexible thinking</td>
<td>D4 Supporting the handicapped</td>
<td>C4 Innovation</td>
<td></td>
</tr>
<tr>
<td>C3 Self-management</td>
<td>A1 Creative thinking</td>
<td>D2 Flexible thinking</td>
<td>D4 Supporting the handicapped</td>
<td>C4 Innovation</td>
<td></td>
</tr>
<tr>
<td>C3 Self-management</td>
<td>A1 Creative thinking</td>
<td>D2 Flexible thinking</td>
<td>D4 Supporting the handicapped</td>
<td>C4 Innovation</td>
<td></td>
</tr>
</tbody>
</table>

### Table 14. Mean and Standard Deviation of importance evaluation by graduates and external experts

<table>
<thead>
<tr>
<th>Competency Item No.</th>
<th>M</th>
<th>SD</th>
<th>Competency Item No.</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 Problem solving</td>
<td>3.49</td>
<td>.622</td>
<td>C1 Learning Innovation</td>
<td>3.49</td>
<td>.597</td>
</tr>
<tr>
<td>A2 Problem solving</td>
<td>3.69</td>
<td>.526</td>
<td>C2</td>
<td>3.19</td>
<td>.677</td>
</tr>
<tr>
<td>A3 Problem solving</td>
<td>3.64</td>
<td>.555</td>
<td>C3</td>
<td>3.29</td>
<td>.647</td>
</tr>
<tr>
<td>A4 Problem solving</td>
<td>3.51</td>
<td>.622</td>
<td>C4</td>
<td>3.15</td>
<td>.677</td>
</tr>
<tr>
<td>A5 Information communication</td>
<td>3.28</td>
<td>.656</td>
<td>C5</td>
<td>3.45</td>
<td>.569</td>
</tr>
<tr>
<td>A6 Information communication</td>
<td>3.27</td>
<td>.695</td>
<td>C6</td>
<td>2.90</td>
<td>.787</td>
</tr>
<tr>
<td>B1 Social relationship</td>
<td>3.67</td>
<td>.502</td>
<td>D1</td>
<td>3.40</td>
<td>.662</td>
</tr>
<tr>
<td>B2 Social relationship</td>
<td>3.68</td>
<td>.484</td>
<td>D2</td>
<td>3.12</td>
<td>.766</td>
</tr>
<tr>
<td>B3 Social relationship</td>
<td>3.76</td>
<td>.445</td>
<td>D3</td>
<td>3.07</td>
<td>.738</td>
</tr>
<tr>
<td>B4 Social relationship</td>
<td>3.71</td>
<td>.488</td>
<td>D4</td>
<td>2.80</td>
<td>.764</td>
</tr>
<tr>
<td>B5 Social relationship</td>
<td>3.44</td>
<td>.621</td>
<td>D5</td>
<td>3.11</td>
<td>.711</td>
</tr>
</tbody>
</table>

### V. Conclusion

The purpose of this study was to develop a model of core competencies in higher education and to verify the statistical validity of the model. Based on a review of the literature, four potential competencies (problem solving, community, self-direction, and co-existence) and 12 practical skills (creative thinking, critical thinking, collaboration, empathy, leadership, learnability, globalization, rehabilitation, social service, multi-culture) were identified. The result of an exploratory factor analysis using an importance questionnaire collecting data from professors and administrative staffs revealed, five core competencies (problem solving, innovation and communication; social relationship; learning innovation; care & co-existence) and twelve practical skills (creative thinking, critical thinking, information literacy, communication, cooperation, empathy, learnability, innovation, globalization, rehabilitation, social service, and
The revised model is identified as valid and reliable. Moreover, through the importance-performance analysis of data collected from students, graduates, and external experts, further validation of the model was also conducted. Therefore, it can be concluded that the revised model of core competencies in higher education is valid and reliable.

The implications of this study are as follows. First, this study developed a multifaceted and comprehensive core competency model in terms of establishing and validating the common core competency by major stakeholders (professors, students, administrative staffs, graduates, external experts), all of whom participated in the process of developing the university’s core competency. Additionally, the study attempted to overcome the existing researches’ limitation of dealing only with a part of the stakeholders. In order for a change or innovation to be successful, participation of all stakeholders is very important, since they decide whether the core competency should be applied to university curriculums or not. Moreover, research revealed that the university administration needs to provide ample time for each department to transform, innovate, and integrate the core competencies into their curriculums [16]. Furthermore, the participation and intervention of local industries and, in particular, communities should also be accompanied by the development of curriculum and the integration of core competencies.

It is also important to highlight that the core competencies derived from this study are focused on the common or generic abilities of a university rather than specific content knowledge to obtain a particular major. However, this perspective does not contrast with Trilling and Fadel (2009)’s suggestion [13] that various powerful forces such as knowledge work, thinking tools, digital lifestyle, and learning research should be converged for leading us toward new ways of learning for life in the 21st century. The generic core competencies that this study suggests are more viable for application in to a liberal arts curriculum than one in a specific major which focuses on specific knowledge areas. Based on the developed core competencies, a competency-based educational curriculum which integrates generic and specific competencies can be designed and developed for each major.

The results also contain certain limitations. First, the core competencies to be developed in this study focus solely on common or generic ability and not on specific university majors. However, since core competencies are based on ‘generic skills’ rather than ‘specific skills’, they cannot ignore basic aspects of general knowledge. Second, the study did not include the participation of parents. Although it tried to reflect a variety of stakeholders’ opinions, it did not include all the related stakeholder’s ones. In the future, empirical research would from using the model in this study in the investigation of measurement and evaluation of core competencies in higher education.

REFERENCES
[10] O. Zlatkin-Troitschanskaia, H. A. Pant, C. Kuhn, M.


Author

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