

# Learning Analytics of Core Competencies: A Comparative Study of Students, Academics, and Industries

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**Abstract:** Core competencies are the combination of pooled knowledge and technical capacities that allow a person to be competitive in the marketplace. In this study, we applied a curriculum-level, competency-based visualized analytic system (the VACC) that has been developed by Yuan Ze University to analyze the levels of students' core competencies. The VACC system provides visual diagnostic functions for quickly understanding and positioning levels of students' core competencies. The course-taken data of 335 students from the Information Management Department at Yuan Ze University were collected and analyzed. In addition, to understand whether students' core competencies have matched marketplace, we surveyed 21 professors from the department and 53 managers from related industries to understand their perceptions of importance of core competencies. The results of competency perceptions from the academia and industries were further compared to students' core competency charts that were generated from the VACC system to measure the gaps among these three stakeholders. The diagnostic results of VACC showed that students have taken more courses on building their competencies of cultivating a broad knowledge and skills in the field of information management. There was a huge gap when students' core competency radar charts were matched to those from academia and industries. While faculties perceived the development of professional skills and the capacity of problem solving was more important than the other competencies, managers from industries suggested whether students can collaborate and team up with others was the crucial competency that market needs. Through learning analytics of students' core competencies and comparison of competency perception among faculties and managers, we can refer these results to diagnose current curriculum and facilitate course design in the future.

**Keywords:** Core competency, learning analytics, visualization, curriculum

## 1. Introduction

Trends in higher education are influenced by rapidly changing global, societal, political and economic forces. To stay relevant, institutions of higher education must be positioned to adapt quickly and deliver education in new ways. Combined with innovation of technology information, the impact of globalization and the development of the global knowledge economy, these competitive forces have currently shaped higher education (Rust & Kim, 2012). Nowadays, college graduates are facing tough competitive challenges in the marketplace. Students in higher education need to build up distinctive capacities and enhance unique competitiveness for their career planning. In this stream, competency-based education continually gains its spotlight in the higher education curriculum design.

The World Economic Forum (2008) viewed higher education as an economic asset and recognized transcendent development of higher education can contribute greatly to the level of national competitiveness. Nowadays, competitors in job market are not only from domestic counterparts, college graduates encounter competition from all over the world. How to effectively graft a students' core competency that has been cultivated from school to the global, competitive workforce has become a

great challenge in higher education. To have a competitive niche and good quality of education, educators have suggested that primary task of higher education is to correspond teaching objectives and set goals for developing students' core competencies (Marginson, 2006). Gallon, Stillman, and Coates (1995) defined core competencies in an organization as "aggregates of capabilities, where synergy is created that has sustainable value in the face of potential competition". From an individual perspective, core competencies indicate the combination of knowledge, skills, abilities, and attributes needed to perform specific professional tasks, they are the available advantages for students when face furious competition in the marketplace (Pralhad & Hamel, 1990; Lahti, 1999).

The cultivation of skill-training and management of talent has become a strategic priority in higher education, it is important for departments and institutes to set educational goals and to correspond these goals with curriculum design (Pope & Reynolds, 1997; Vincent & Focht 2009). For course planning, it is feasible to establish an association between competency-based curriculum and development of student capacity (Pembbridge & Paretti, 2010). However, there is a lack of proper techniques and universal tools to estimate students' core competencies in practice. To this end, we applied a curriculum-level, competency-based visualized analytic system (the VACC) that has been developed by Yuan Ze University (YZU) to actually calculate levels of students' core competencies for each student. By using this system, the quantity and quality of students' courses taken and grades were automatically collected and calculated to estimate the levels of students' core competencies. This study investigated levels of students' core competencies by using the VACC system. In addition, different aspects of core competencies from faculties and managers were surveyed to compare with that of students'. Through learning analytics of students' core competencies and comparison of competency perception among faculties and managers, we can refer these results to diagnose current curriculum and facilitate course design in the future.

## 2. Methods

An archive of learning behaviors and data of 335 students who attended the Department of Information Management at the YZU from the year of 2013-2015 was selected from the databank of YZU Virtual Classroom. After selecting the cases, students' longitudinal learning records of course taken history and grades were automatically collected and analyzed by the Visualized Analytics of Core Competencies system. The VACC system has embedded in the Virtual Classroom since 2013 at the YZU. The current version of VACC system provides descriptive analytics and a learning dashboard for students' reflection. When a student logs in the core competency page of YZU Portal site, the VACC system will automatically calculate the extent of correspondence between student's courses taken and his/her position of core competencies, and presents nine radar charts of core competencies from both quantity and quality aspects. In addition, the system visualizes rankings of students' competencies in comparison with peers and provides diagnostic outcome.

To understand whether students' core competencies have matched the labor market, we further surveyed 21 professors from the Information Management Department and 53 managers from related industries to understand their perception of importance of core competencies. A survey questionnaire was designed for this purpose. Based on the educational objectives of Information Management Department at Yuan Ze University, 5 core competencies are expected to cultivate in the curriculum design. The questionnaire surveyed faculties and managers from industry and use the Analytic Hierarchy Process (AHP) method to rank the importance of these 5 core competencies. Finally, we compare the results of competency perceptions from the academia and industries to students' competency charts at the VACC to explore gaps among these three stakeholders

The 5 core competencies are as followed:

1. Students should be able to use analytical and appropriate technologies to demonstrate the capacity of problem-solving (A).
2. Students should be able to collaborate and team up with others (B).
3. Students should have a broad sense and pooled knowledge in the information management field (C).
4. Students should be able to demonstrate the capacity of integration for decision making (D).
5. Students should understand the importance of work ethic (E).

### 3. Results

#### 3.1 Analytics of student' core competencies

The results of students' learning analytics of core competencies by the VACC system from the year of 2013 to 2015 are shown in Figure 1. Green line in the radar charts indicates the high credit hour group that has taken competency-related courses (the credit hours was over 75% percentile). Red line indicates the low credit-hour group (below 25% percentile in the population). Blue area reports those with average credit hours in related competencies. Numbers in the radar charts indicate average credit hour of courses taken in each of the 5 competencies.

Cross-time comparison in Figure 1 indicates that students were relatively consistent in competency-related courses taking over 3 years. In general, students took more of the C competency-related courses which designed to cultivate students with a broad sense and pooled knowledge of information management. Secondly, students were more likely to take courses that related to B competency which demonstrated their capability to team up and collaborate with others. Next were the A and D competencies. While students took a few more course in related to the D (decision making) competency in year of 2013, students in year of 2015 took more on the A (problem solving) competency-related classes. The competency that students took the fewest courses over 3 years of time was the understanding the importance of work ethics (E). Department and institute can use these students aggregated results to diagnose and adjust current curriculum, evaluate teaching objectives and provide suggestion for future course design.

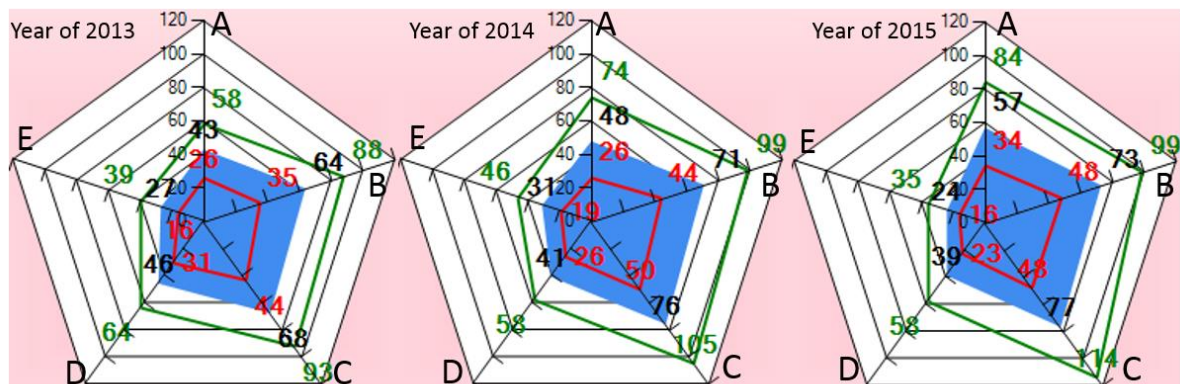


Figure 1. Radar charts of students' core competency in year of 2013-2015.

#### 3.2 Perceptions of core competency among academia and industries

To understand whether students' core competencies have matched with other stakeholders, specifically, those in the marketplace, we calculated and weighted the ranks of 5 competencies from university professors in the department and managers in related industries. Figure 2 shows their perceptions of importance among these 5 competencies. The left side of radar chart in Figure 2 illustrates academic priority of core competency regarding students at the information management department. The AHP results indicated that professors concerned the most on students' capacity of problem-solving (A, score 5). The competencies of students' decision making (D) and have a broad sense and pooled knowledge of information management (C) ranked the second and the third highest priorities at the score of 4.86 and 4.71 respectively. Relatively, faculties from the department concerned less on students' understanding of work ethics (E, 2.93) and students' competencies of collaborating and team up with others (B, 2.81).

The right side of radar chart in Figure 2 illustrates industries' perspective on the five core competencies. In general, managers from the industries pinpointed the capacity of collaboration and team up with others was the crucial competency in the related fields (B, score 5), followed by the competencies of problem-solving (A, 3.19) and decision making (D, 3.08) that managers in the industries thought were important for graduates from information management departments. Consistent with faculties' perception, industries concerned less on the competency of work ethics (E,

2.97). Different from others, the competency that managers considered the least important was whether students have a broad sense and pooled knowledge of information management (C, 1.97). Apparently, industries have very much different point of views of competency C in compared to the others.

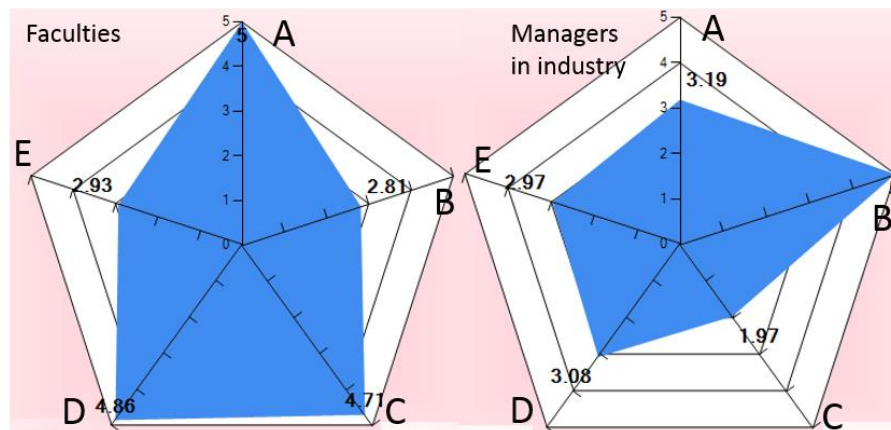


Figure 2. Perspectives of faculties (left) and managers in industry (right).

#### 4. Conclusion

The diagnostic tool of radar charts in the VACC system showed that students have taken more courses on building their competencies of cultivating a broad knowledge and skills in the information management field. The competency that students concerned the least was the understanding the importance of work ethics. The visualization of radar charts of students, academia and industrial managers suggested their perceptions of core competency differ significantly from one of the others. While university faculty perceived the development of professional skills and the capacity of problem solving was more important than the other competencies, managers from industries suggested that the capacity of collaborating and team up with others was the crucial competency that market needs.

Through learning analytics of students' core competencies and comparison of competency perception among faculties and managers, we can refer these results to diagnose current curriculum and facilitate course design in the future. A tight correspondence of curriculum design and core competencies is necessary to cultivate competitive niche for college students. The institutes of higher education need to take into account aspects from different stakeholders, initiate more diverse curriculum designed to provide choice (Baynes, 2010). There has been a growing emphasis of higher education on the use of core competencies to design and implement curriculum. The VACC system provides a diagnostic tool to reflect students' core competencies and supports descriptive analytics for assisting not only students in self-directed learning but also teachers in counseling and curriculum enhancement.

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