

A Study on the Comparison of Educational Effects between Convergence Majors and Single Majors in R Lecture

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Abstract

The purpose of this paper is an analysis of the difference between convergence majors and single majors in the convergence core competency and educational performance. We used survey data for the analysis of the convergence core competencies, the results of the midterm and final exams for the education performance. Analysis targets are 10 students in big data business intelligence at Seokyeong University as convergence majors and 11 students in business administration as single majors. The target course was an analysis of economic data provided in the second semester of 2019. And the lecture contents were analysis of big data using R programming. The survey was conducted on December 5, 2019. The convergence core competences were creative thinking, critical thinking, understanding convergence knowledge, problem solving ability, communication skills, cooperation ability, use of convergence tools, consideration, and responsibility. As results of homogeneity tests, we found that there was no significant difference in all competencies, but there were very significant differences in the educational performance evaluated by the midterm and final exams. Therefore we can see willingness to convergence of single majors was no different from that of convergence majors, but had not led to practice. It is desirable to activate and support convergence courses.

Keywords: Chisquare test, Convergence, Core competence, Educational Performance, T test

1. Introduction

The dictionary meaning of convergence is the term used in chemistry to mean that different kinds of things are melted and merged together without distinction. It means combining several concepts to make one concept. In the academic field, it means that different disciplines are linked or integrated with each other to create a new one. S.H. Bae insisted on the background of convergence education at the site of the Ministry of Education as follows. It started with a reflection that the current academic system was too fragmented to make understanding of the phenomena to be explored only partially, and there was a limit to grasping the overall meaning. The need for convergence education was also emerging in the field of education. This is related to

talent changes. The world has become a time when people with integrated thinking skills are needed to actively respond to rapidly changing environments and creatively solve the problems they face. A new educational paradigm is needed to enable learners to experience and think more comprehensive and creative perspectives across academic boundaries. They are the background of convergence education [1].

Convergence courses in Korean universities were introduced by many universities with policy support of Ministry of Education from about 2010. G.Y. Ryu and T.H. Han (2019) investigated the current status of convergence education at universities in Seoul. Results are shown in Table 1. The number of convergence courses of 21 universities was 12.1 on average, 12 on median, and 6 on mode. The largest number of universities offers six courses. Since the average and median are 12 courses, we can see that other universities operate a large number of convergence courses [2].

Table 1. Current status of convergence courses at universities in Seoul

University	Number of convergence courses
Konkuk University	6
Kyung Hee University	5
Korea University	28
Kookmin University	18
Myongji University	12
Sahmyook University	6
Sangmyung University	14
Sokang University	15
SeoKyeong University	6
Seoul National University	6
Seoultech University	6
Sung Kyun Kwan University	13
Sejong University	16
Soongsil University	13
Yonsei University	14
Chung-Ang University	8
Hankook University of Foreign Studies	9
Hanyang University	15
Hongik University	9
The Catholic University of Korea	10
Dongguk University	26

In a validity study on the key competencies factors of STEAM by Ki-moon Park et al. (2014), three factors were identified as convergence cognitive ability, convergence performance, and convergence attitude ability [3]. They are consistent with the results of Spencer & Spencer (1993) and OECD (2003) [4, 5]. In order to cultivate convergence competency, they insisted convergence education should provide creative thinking, critical thinking, understanding convergence knowledge, problem solving ability, communication skills, cooperation ability, use of convergence tools, consideration, and responsibility. We call 9 elements as convergence core competences (CCC).

In this paper, we will analyze the difference between convergence majors and single majors for CCC. The comparison of the convergence core competencies will use the competency assessment questionnaire made by Seokyeong University. And educational performance measurement will use the R test scores taught in

economic data analysis in the second semester of 2019, because R is a useful software in big data as used by J.M. Kang and S.W. Lee (2019) and G.Y. Ryu (2019) [6, 7].

2. Research Design

For this study, CCC and educational performance of convergence majors and single majors will be compared and analyzed. The research subjects are that 10 students are majoring in big data business intelligence at Seokyeong University, and 11 students are majoring in business administration. The course was economic data analysis which taught big data analysis using R programming in the second semester of 2019. In order to make the contents of the lecture the same, the course was conducted without being separated. We will evaluate CCC using the question related to convergence capability in the competency evaluation questionnaire made by Seokyeong University. The evaluation of academic achievement will use the scores of midterm and final exam.

In order to analyze whether two distributions are the same in a nominal variable such as a questionnaire, a test of homogeneity is performed. The homogeneity test is a method to test whether the distributions obtained by the nominal variables are same. Table 2 shows the data structure. Chisquare test explained by Alexander Holmes, Barbara Illowsky, and Susan Dean (2017) will be used [8]. G.Y. Ryu (2018) used this test [9].

Table 2. Table obtained by nominal variable

Question	Convergence majors	Single majors
Very agree	N11	N21
Generally agree	N12	N22
Half and half	N13	N23
Generally disagree	N14	N24
Very disagree	N15	N25

The differences between the two groups obtained by continuous variables like the scores of midterm and final exam, will be analyzed using the mean. T-test described in D. Anderson, D. Sweeney, and T. Williams (2014) will be used [10].

3. Results

To evaluate CCC, we used the survey of a competency evaluation made by Seokyeong University, and conducted on December 5, 2019. The data from questionnaire related to CCC would be analyzed.

As for creative thinking, data were shown in Table 3. Because all P-values are greater than 0.05, the null hypothesis of the homogeneity test don't be rejected. So we cannot find evidence that the two distributions are different.

Table 3. Creative thinking

Question	P-value
I tend to come up with unique ideas that others can't think of.	0.3654
I often create my own ideas by synthesizing various information I already knew	0.2997
When working on a team assignment, I tend to suggest new ideas.	0.7614
Often times, problems are solved through sudden and erratic thoughts.	0.6365

As for critical thinking, data were shown in Table 4. Because all P-values are greater than 0.05, the null hypothesis of the homogeneity test don't be rejected. So we cannot find evidence that the two distributions are different.

Table 4. Critical thinking

Question	P-value
I can easily compare the advantages and disadvantages of the different methods of solving the problem.	0.6923
I can tell critical content about the other person without hurting the other person's feelings	0.2746

As for understanding convergence knowledge, data were shown in Table 5. Because all P-values are greater than 0.05, the null hypothesis of the homogeneity test don't be rejected. So we cannot find evidence that the two distributions are different.

Table 5. Understanding convergence knowledge

Question	P-value
Even in a complicated situation, i have a tendency to analyze the cause of the problem from various aspects.	0.7963
I am learning other major or knowledge that I can use in my major.	0.5549

As for problem solving ability, data were shown in Table 6. Because all P-values are greater than 0.05, the null hypothesis of the homogeneity test don't be rejected. So we cannot find evidence that the two distributions are different.

Table 6. Problem solving ability

Question	P-value
I tend to find out what's at the heart of the problem I'm currently working on.	0.6357
When a problem occurs, i try to find out what the cause is.	0.5269
I find an effective way to do my homework.	0.3881

As for communication skills, data were shown in Table 7. Because all P-values are greater than 0.05, the null hypothesis of the homogeneity test don't be rejected. So we cannot find evidence that the two distributions are different.

Table 7. Communication skills

Question	P-value
To understand the intention that the other person wants to express, i look carefully at the expression or gesture as well as the other person's words.	0.8649
When i talk, i tend to speak easily according to the gender or age of the listener.	0.1549

As for cooperative ability, data were shown in Table 8. Because all P-values are greater than 0.05, the null hypothesis of the homogeneity test don't be rejected. So we cannot find evidence that the two distributions are different.

Table 8. Cooperative ability

Question	P-value
I help people in need.	0.4624
If I have to give up my pleasure or convenience to help others, I will gladly give up.	0.5466

As for use of convergence tools, data were shown in Table 9. Because all P-values are greater than 0.05, the null hypothesis of the homogeneity test don't be rejected. So we cannot find evidence that the two distributions are different.

Table 9. Use of convergence Tools

Question	P-value
I can think about humanities, human psychology, philosophy, etc. in relation to my major	0.6859
When the answer is ambiguous, we often come up with solutions in a variety of ways.	0.7454

As for consideration, data were shown in Table 10. Because all P-values are greater than 0.05, the null hypothesis of the homogeneity test don't be rejected. So we cannot find evidence that the two distributions are different.

Table 10. Consideration

Question	P-value
I care if my actions will not harm others.	0.6929
I tend to match the other person's mood.	0.6654
I quickly figure out what others need.	0.2829

As for responsibility, data were shown in Table 11. Because all P-values are greater than 0.05, the null hypothesis of the homogeneity test don't be rejected. So we cannot find evidence that the two distributions are different.

Table 11. Responsibility

Question	P-value
When a group has more than five people, i act as a leader.	0.4985
When i do a team project, i share the roles of the team members.	0.9559

In order to measure whether there is a difference in educational performance between the two groups, the scores of the midterm and final exams will be compared and analyzed. A t-test was performed. Results are shown in Table 12. There were average differences between the two groups, because P-values of the midterm exam is 0.00009769, and that of the final exam is 0.004945. Looking at the average difference, the average of

convergence majors in the midterm exam was 22.14 points higher than that of single majors. The average of convergence majors in the final exam was 19.9 higher than that of single majors. Therefore, it can be seen that convergence majors had much higher educational performance than single majors.

Table 12. T-test

Item	t-value	P-value	Mean difference
Midterm test	3.9338	0.0009769	22.14
Final test	3.351	0.004945	19.70

4. Conclusion

The purpose of this paper is an analysis of the difference between convergence majors and single majors in CCC and educational performance. We used survey data for the analysis of CCC, the scores of the midterm and final exams for the education performance. The questionnaire of Seokyeong University for competency evaluation was used. The subjects were creative thinking, critical thinking, understanding convergence knowledge, problem solving ability, communication skills, cooperation ability, use of convergence tools, consideration, and responsibility. As results of homogeneity tests, there was no significant difference in all competencies. In other words, there was no significant difference in attitude toward CCC between convergence majors and single majors. However, there were very significant differences in the educational performance evaluated by the midterm and final exams. Therefore we can see willingness to convergence of single majors was no different from that of convergence majors, but had not led to practice.

Universities began to introduce convergence courses around 2010. We revealed that convergence majors were not only willing to cultivate CCC, but also practiced higher than single majors. Therefore, it is desirable to activate convergence courses. And continuous activation and support are needed to achieve the goal of convergence education.

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