Analysis of University Unification Education Research Trends Using Text Network Analysis and Topic Modeling

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Abstract

Purpose: This study analyzed papers identified by entering the two keywords 'unification education' and 'university' during research from 2013 to 2022 in order to identify trends and key concepts in unification education research at domestic universities. **Research design, data, and methodology**: The study analyzed 224 papers, excluding those on primary, middle, and high school unification education, as well as unrelated and duplicate papers. The analysis included developing a co-occurrence network of keywords, utilizing topic modeling to categorize research types, and confirming visualizations such as word clouds and sociograms. **Results**: In the final analysis, the research identified 1,500 keywords, with notable ones like 'Korea,' 'education,' 'unification.' Centrality analysis, measuring influence through connected keywords, revealed that 'Korea,' 'education,' 'north,' and 'unification' held significant positions. Keywords with high centrality compared to their frequency included 'learning,' 'development,' 'training,' 'peace,' and 'language,' in that order. **Conclusions**: This study investigated trends and structures in university-level unification education by analyzing papers identified with the keywords 'unification education' and 'university.' The use of keyword network analysis aimed to elucidate patterns and structures in university-level unification education. The significance of the study lies in offering foundational data for future research directions in the field of unification education at universities.

Keywords : Text Network Analysis, Topic Modeling, Unification Education, Research Trends, Visulization

JEL Classification Code : I20, I23, I29, C46

1. Introduction

Unification education encompasses school unification education targeting elementary, middle, and high school students and social unification education for the general public. For university students, it falls between these two boundaries (Min et. al., 2019). Unification education at the university level is conducted primarily within departments related to general education or majors and is subject to students' choices.

The perception of unification among university students is negative (Korea Institute For National Unification, 2022). The 2018 revision of the Unification Education Support Act laid the foundation for enhancing unification education at universities (Cho, 2021). With the government's support, opportunities for unification education at universities have expanded, particularly centered around Unification Leading Universities (Ryu & Ahn, 2022). The number of universities offering unification education increased from 94 in 2015 to over 128 in 2021 (Cho, 2021). However, despite the quantitative increase in courses and opportunities, there has been no significant change in university students' perception of unification (Lee & Kim, 2020). Despite the quantitative expansion of opportunities, there is a need for a reassessment of unification education for university students. Therefore, it is necessary to examine research trends in unification education at the university level.

In this study, we aim to analyze the trends in domestic university research on unification education using the keyword network analysis method, which is increasingly utilized as one of the recent big data analysis methods. Through keyword network analysis, we intend to analyze textual content in terms of its substance, encode the relationships between key words, and visualize the relationships between relevant words. The keyword network analysis method is effective in analyzing research trends as it not only identifies the frequency of key words but also visually portrays the relationships and strengths between key words, highlighting important concepts and their interrelations (Lee, 2018).

Considering the significance of research on unification education at the university level, understanding research trends through traditional content analysis, along with using keyword network analysis to comprehend the structure and evolution of relationships between keywords, will be crucial for providing a systematic approach to the execution and future directions of unification education. Therefore, this study aims to analyze the structure and relationships of keywords presented in university research on unification education using the keyword network analysis method and to analyze trends in unification research.

1.1. Objectives of Research

This study applied text network analysis to understand trends and key concepts, with specific goals of identifying core themes, major semantic structures, and changes in research topics over time.

Firstly, it aims to identify the key keywords in research on unification education at domestic universities.

Secondly, it seeks to examine the centrality and intermediary centrality between the key keywords in research on unification education at domestic universities.

Thirdly, it aims to identify the types of trends and thematic flows in research on unification education at domestic universities.

2. Study Method

2.1. Research Design

This study is an investigation of keywords in domestic academic research related to university unification education. The study involves extracting these keywords from textual data and analyzing them using network analysis and topic modeling.

2.2. Research Procedure

This study involved the collection of academic research using bibliographic information. The process included extracting keywords, preprocessing data, developing a co-occurrence network, and performing topic modeling analysis.

2.2.1. Collection of Academic Research Data

For the analysis of this study, papers were collected from literature search databases where bibliographic information can be extracted, such as the Research Information Sharing Service (RISS) and the Korea Citation Index (KCI). The search scope was set to domestic academic papers, and keywords 'unification education' and 'university' were used to extract the bibliographic information of all identified papers from 2013 to 2022 in an Excel file. After excluding duplicated papers, 224 studies were identified that included both keywords of unification education and university. As various variables were presented for related keywords, the selection was made through an agreement between the researchers and experts in education who specialize in education based on the titles of the extracted papers. After excluding duplicated papers, the extracted papers were confirmed to have been published as follows: 10 papers in 2013, 20 papers in 2014, 20 papers in 2015, 18 papers in 2016, 21

papers in 2017, 22 papers in 2018, 27 papers in 2019, 29 papers in 2020, 31 papers in 2021, and 26 papers in 2022 [Figure 1].

Figure 1: Publication Status of Research on University Unification Education by Year

2.2.2. Development and Analysis of Co-occurrence Network

In this study, the preprocessed and refined keyword data were analyzed using centrality analysis and topic modeling methods through the process of 1-mode matrix transformation using the NetMiner program (version 4.4). During the analysis, clusters or proper nouns representing a single meaning were set as designated terms.

For keyword analysis, keywords with a frequency of 30 or more appearances were identified. Subsequently, for keywords with high occurrence frequencies, the degree centrality was analyzed through the number of directly connected neighbor nodes. A high value of degree centrality indicates that the keyword can easily spread to other keywords, signifying its influence. Keywords with high degree centrality are recognized as important and considered central topics in the discussion, representing a core position in the network.

Additionally, topic modeling using the LSD technique was employed to analyze the types of research. Word clouds and sociograms were visualized for further analysis. The keyword analysis method is as follows:

Firstly, all extracted concepts were separated into individual words based on spacing.

Secondly, adjectival core keywords were modified to nouns, and adjectives decorating core keywords were treated as a single word based on usage frequency, including words containing "~적" or "~한."

Thirdly, if the meanings were similar or encompassed, they were modified into a single word, and the modified words were also adjusted for analysis in the abstract.

The finalized 690 words were analyzed for overall frequency. The network map was visualized by converting the co-occurrence frequency matrix (coocc.dbf) extracted through the Krtitle program in KrKwic into an Excel file and using the NetMiner program to graph the correlations. After completing the network map, isolated nodes unrelated to other keywords were excluded, and the map was generated with only related words.

3. Results

3.1. Major Keywords in Research on Unification Education at Domestic Universities

A total of 224 studies on research related to unification education and universities conducted in South Korea from 2013 to 2022 were identified. The final analysis of the papers presented a total of 1500 keywords. The key keywords analyzed in this study, up to the 39th rank based on frequency (with a frequency of 30 or more), are listed in Table 1. The most frequently appearing keyword was "Korean" with 852 occurrences, followed by "Education" with 700 occurrences, and "North" with 570 occurrences, as shown in Table 1.

Table 1: Keyword and Frequency

Rank	Keyword	Frequency
1	Korea	852
2	Education	700
3	North	570
4	Unification	426
5	National	120
6	School	98
7	South	96
8	Peace	86
9	History	84
10	Defector	78
11	System	74
12	Language	74
13	Curriculum	70
14	University	68
15	Policy	64
16	Christian	58
17	Writing	56
18	Textbook	54
19	University	50
20	Training	50
21	Teacher	50
22	Chinese	50
23	Integration	48
24	Law	46
25	War	44
26	Development	40
27	China	40
28	Movement	40
29	Rights	38
30	Culture	36
31	Germany	36
32	Human	36
33	Identity	36
34	Learning	34
35	Analysis	34
36	Research	32
37	Music	32
38	Study	30
39	Life	30

3.2. Relationships among Key Keywords in Unification Education and University Research

The results of the analysis on the centrality of connections for the keywords presented in the target papers of this study, revealing 37 highly influential keywords, are shown in Table 2. In the centrality analysis that assesses influence based on the number of connected keywords, the order was confirmed as Korea, Education, North, Unification, and National. Keywords with high centrality in the network can be considered as actively central words (Choi & Park, 2021).

Keywords with high centrality compared to their frequency rank include Study, Development, Training, Peace, Language, and Curriculum. On the other hand, keywords such as Chinese, Writing, War, and Defector, which ranked high in frequency, had lower centrality compared to their frequency rank, as shown in Table 2.

Table 2: Relation between Key Words

Rank	Keyword	Frequency	Keyword	Degree Centrality
1	Korea	852	Korea	0.953488
2	Education	700	Education	0.953488
3	North	570	Study	0.953488
4	Unification	426	North	0.930233
5	National	120	Unification	0.930233
6	School	98	School	0.906977
7	South	96	South	0.906977
8	Peace	86	National	0.883721
9	History	84	History	0.883721
10	Defector	78	System	0.883721
11	System	74	University	0.883721
12	Language	74	Development	0.883721
13	Curriculum	70	Policy	0.860465
14	University	68	Textbook	0.860465
15	Policy	64	College	0.860465
16	Christian	58	Curriculum	0.837209
17	Writing	56	Culture	0.837209
18	Textbook	54	Training	0.813953
19	University	50	Learning	0.813953
20	Training	50	Peace	0.767442
21	Teacher	50	Language	0.767442
22	Chinese	50	Integration	0.767442
23	Integration	48	Analysis	0.767442
24	Law	46	Life	0.767442
25	War	44	Teacher	0.72093
26	Development	40	China	0.72093
27	China	40	Movement	0.72093
28	Movement	40	Christian	0.674419
29	Rights	38	Law	0.674419
30	Culture	36	Germany	0.674419
31	Germany	36	Rights	0.651163
32	Human	36	Chinese	0.627907
33	Identity	36	Research	0.581395
34	Learning	34	Writing	0.534884
35	Analysis	34	War	0.488372
36	Research	32	Defector	0.395349
37	Music	32	Human	0.395349
38	Study	30	Music	0.116279
39	Life	30	Identity	0.093023

3.3. Trends and Patterns in Research Topics Related to University and Unification Education

The sociogram utilizing the overall topic modeling in this study is depicted in Figure 2, and the sociogram visualizing the relationships among key keywords for the four topics is presented in Figure 3. The word clouds drawn based on the frequency of keyword occurrences throughout the topic modeling analysis process are shown in Figure 4.
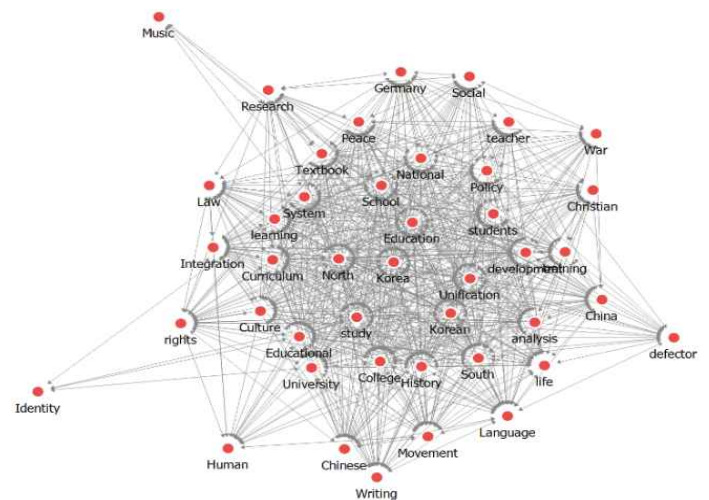
Figure 2: Sociogram Using Topic Modeling
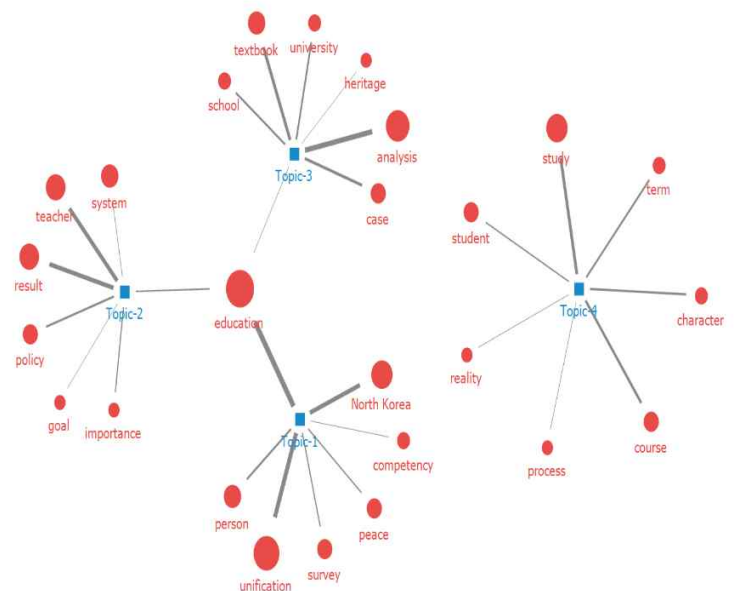
Figure 3: Sociogram Visualizing the Relationship between Major Keywords for 4 Topics

Figure 4: Word Cloud Using Frequency of Occurrence

4. Conclusions

This study aims to understand the trends and key concepts in domestic research on unification education at universities. By extracting related keywords and analyzing their occurrence frequency, as well as examining their connectivity, proximity, and intermediary centrality, the study explores trends over time. Furthermore, it objectively analyzes the network structure of keywords to examine changes in research focus. The goal is to provide directions for the future development of unification education at universities.

Firstly, the research from 2013 to 2022 shows an overall increasing trend. Starting with 10 publications in 2013, the number rose to 27 in 2018 and has continued to increase. This is believed to be a result of the 2018 amendment to the Unification Education Support Act and government policies and support for unification education.

Secondly, the top three keywords related to unification education and universities are 'Korea,' 'North,' and 'South.' This indicates an exploration and comparison of the situations in the North and South while implementing unification education. Additionally, 'Peace' holds the eighth position, reflecting the significance of understanding active and genuine peace in unification education. 'Defector' ranks tenth, highlighting the need for more research and education given the situation of over 43,000 North Korean defectors. 'Germany,' with a frequency of 36, serves as an example, allowing South Korea to draw insights for unification despite differences in situations.

Thirdly, the sociogram visualizing the relationships among key keywords for the four topics shows interesting connections. In Topic-1, keywords like 'education,' 'North

Korea,' 'competency,' 'peace,' 'survey,' 'unification,' and 'person' are prominent. Topic-2 includes keywords such as 'education,' 'system,' 'teacher,' 'result,' 'policy,' 'goal,' and 'importance.' Topic-3 presents keywords like 'education,' 'school,' 'textbook,' 'university,' 'heritage,' 'analysis,' and 'case,' all connected through the shared keyword 'education.' Lastly, Topic-4 displays keywords like 'student,' 'study,' 'term,' 'character,' 'course,' 'process,' and 'reality,' visualizing the composition of the educational process.

This study focused on papers published in education journals among domestic journals and candidates for inclusion. While it inevitably includes a large number of papers with the keywords 'unification' and 'education,' potential limitations exist. Future research could complement these limitations by examining how the topic of unification education is presented in research fields other than education and performing comparative analyses. Continuous follow-up studies addressing the presented limitations are expected to contribute to the ongoing academic development of the field of unification education research.

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