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An Analysis of Research Trends in Mobile Learning through Comparison between Korea and China using Semantic Network Analysis

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This study aims to compare and analyze the trends of research on mobile learning conducted in Korea and China to suggest future directions and multifaceted subject areas in its study field. To achieve this purpose, 620 Chinese papers from CNKI (CSSCI and CSCD) database and 205 Korean papers from RISS database (KCI and KCI candidate) published between 2009 and 2018 were selected to be analyzed through applying the frequency analysis and visualized semantic network analysis. The criteria for analysis used in this study are four types: publication years, research subjects, research methods, and keywords. The results of this study are as follows. Firstly, in relation to the year of publication, Korea entered the peak of mobile learning research in 2016 (33 papers), and China reached high publications (94 papers) in 2017. Secondly, with regard to the research subjects, the most frequently studied subjects in Korea and China were targeted to college students, followed by general adult groups. Thirdly, in terms of research methods, quantitative research accounted for a high proportion in Korea, but in China, literature research showed a high frequency. Fourthly, the high frequency keywords appearing in mobile learning research of the two countries were mainly reflected in language learning. Based on the findings, several directions of future research for both countries were suggested.

Keywords : Mobile learning, Research trend analysis, Semantic network analysis

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Introduction

With the popularity of mobile devices such as smartphones and tablets PCs and the rapid development of information and communication technologies, mobile learning has become increasingly popular and has changed the way of living and learning. As a new learning approach, mobile learning can create a perceptible and personalized learning environment for learners, utilizing an influential technology for education (Johnson, Adams, & Cummins, 2012). Furthermore, it is predicted that mobile device based learning with artificial intelligence (AI), Internet of Things (IoT), cloud, and big data as a core technology in the era of 4th industrial revolution is becoming a crucial approach to support personalized learning (Chung, 2017).

Under this context, the results of the UNESCO2012 survey show that governments in most countries across the world give a high degree of support to the mobile learning. It is understood that South Korea and other countries have invested special public or private funds in the field of mobile learning to encourage the use of mobile devices in education through specific programs and projects (UNESCO, 2012). As of 2017, South Korea is an only country to develop policies on mobile learning among Asian countries. The mobile learning policy is a part of the national ICT policies, but they have a clear direction of it (Gu, 2017).

Recently, Korea and China among Asian countries are in a similar situation in that the two promote a nationwide educational reform and innovation. Korea, however, has a myriad of experiences in the aspect of changes of educational method through application of the cutting-edge technology and plays a leading role in the field. For China, there is a great deal of pressure on education to change in line with its policy on educational reform and a lot of effort to seek proper directions for educational change, in particular, in terms of educational method.

In April 2018, China Ministry of Education issued the "Education Informatization 2.0 Action Plan." Some of its development goals include that the teaching application covers all teachers, the learning application covers all

school-age students, the digital campus construction covers all schools, the application level of information technology and the information literacy of teachers and students are generally improved, and the "Internet + Education" platform will have been built to promote the transformation from exclusive educational resources to generally open educational resources by the end of 2022 (China Ministry of Education, 2018). Prior to this, Korea issued an annual plan for the development and dissemination of mobile based language programs to support students' self-directed learning (Korea Ministry of Education, 2016).

In this circumstance, mobile learning in the field of teaching and learning has recently become one of the most important research themes. The various research, in turn, has also led to rapid changes in the development and usage patterns of mobile technology in education. Accordingly, review studies identify progress in the field and offer guidelines for the design of future research (Frohberg, Göth, & Schwabe, 2009). Also, understanding the trends in a specific research field can help education policy makers in making decisions regarding technology and teaching and learning (Wu et al., 2012).

This paper intends to find commonalities and differences in mobile learning research between both countries and provide insights on the research trends through analysis of academic journals published in Korea and China during the last ten years, from 2009 to 2018. To achieve this, the study carries out semantic network analysis using research keywords, as well as the frequency analysis with the analysis criteria including publication years, research subjects, and research methods. Semantic network analysis is a useful method to materialize abstract semantic structure by visualizing linkage modes between words (Kim, 2013). This analysis is able to provide quantitative and qualitative interpretation through exploring semantic structures and analyzing quantitative metrics established from texts (Drieger, 2013; Kim, 2013). Through this process, the study tried to systematically and synthetically review the relevant literature and draw lessons from the analytical results for both countries' educational research field.

Theoretical Background

Understanding of Mobile Learning

As the wireless internet has been widely popularized, the integration with mobile technology in learning has variously changed the shape of education. From a technical point of view, mobile learning is a kind of learning that can be done by learners at any time and any place with the help of mobile computing devices that can effectively present learning content and provide two-way communication between teachers and students (Solstad, Aloka, & Aleksander, 2007). In the same context, Traxler (2005) defined mobile learning as "any educational provision where the sole or dominant technologies are handheld or palmtop devices." However, according to Traxler (2005), these definitions are the technology-centered and put it on the line of e-learning. Moreover, it is easy to draw people's attention to the technical side rather than educational strengths.

In the learner's point of view, mobile learning is also that learners use mobile devices to learn anywhere, anytime (Chabra & Figueiredo, 2002). A widely accepted concept of mobile learning is "using mobile technologies to facilitate learning," while a popular definition of ubiquitous learning is "learning anywhere and at any time" (Hwang, Tsai, & Yang, 2008; Shih, Chu & Hwang, 2011).

In short, mobile learning refers to a kind of learning mode that can achieve access to digital learning resources and educational information at anytime, anywhere, with the help of seamless wireless network and portable mobile communication equipment, and facilitate communication and interaction.

Effectiveness of Mobile Learning

Mobile learning can be achieved through a variety of mobile devices (Quinn, 2000). According to Attewell (2011), most of these mobile devices contribute

greatly in learners' literacy and numeral skills, ICT skills and easy accessibility of information. Simultaneously, mobile learning technology can effectively improve teaching and learning (Shen, Luo, & Sun, 2015), as well as increase lifelong learning in both formal and non-formal education environments (Vavoula & Sharples, 2009).

The use of mobile devices as a teaching and learning tool has been acknowledged in numerous research (Cui and Wang, 2008; Utulu & Alonge, 2012; UNESCO, 2012). In the same context, Huang, Liao, Huang, and Chen (2014) found that using mobile devices to support collaborative learning can not only improve learning activities such as the participation of team members, the frequency of interactions and the quality of interaction, but also significantly enhance learners' performance (Huang et al., 2014; Joo-Nagata, Martinez-Abad, García-Bermejo, & García-Pealvo, 2017). In foreign language learning, Cavus and Ibrahim (2009) reported the positive effect of engaging college students in learning new technical English words using text messaging with mobile phones on their learning achievements. In teaching methods, Hwang, Wu, and Ke (2011) applied an interactive concept map-based mobile learning system to the field trip of an elementary school natural science course and reported the positive effect of the mobile learning approach on the students' learning achievements. On learning motivation, Hwang, Tsai, Chu, Kinshuk, and Chen (2012) conducted an enquiry-based mobile learning activity in a science park and found that the approach could significantly promote the students' learning motivation in comparison with traditional field trips. Meanwhile, Wu, Hwang, and Tsai (2013) use RFID and PDA to observe rocks and conduct exploratory learning in geography laboratories. The results show that mobile-based inquiry learning is beneficial to improve learners' learning performance and inquiry ability.

In sum, various studies have proved the advantages of mobile learning. It can promote learning performance and motivation and the effectiveness of diverse teaching methods.

Precedent Research on Trend Analysis of Mobile Learning

In the past ten years, various studies have been conducted regarding the trend analysis of mobile learning. Cheung and Hew (2009) conducted a review of research methodologies relating to mobile learning in higher education settings. They reviewed 44 articles published until the end of 2008 and found that descriptive research was the most dominant research method and questionnaires were the most used data collection method. Wingkvist and Ericsson (2011) surveyed 114 papers presented at the World Conferences on Mobile Learning in 2005, 2007, and 2008. The focus of the review was on research purposes and research methods. They found that research methods were evenly distributed, with the exception of basic research. In terms of research purpose, the majority of papers were descriptive research. The evaluative research was rare, and it was indicated as a problem (Wingkvist & Ericsson, 2011).

Hwang and Tsai (2011) conducted an analysis of research trends in mobile and ubiquitous learning by selecting 154 articles on mobile and ubiquitous learning based on six major technology-enhanced learning journals from 2001 to 2010. They found that higher education students were the most frequent research sample, followed by elementary school students and high school students. Science, Languages, Arts, and Social Science are the main learning domains for studies of m-learning with a relatively few studies being carried out in Mathematics.

Wu et al. (2012) used a meta-analysis approach to systematically review 164 mobile learning studies published between 2003 and 2010. They also found most research purposes focused on effectiveness and system design, but also found that surveys and experimental methods were the most used research methods and that the research outcomes in studies were significantly positive.

Hung and Zhang (2012) investigated mobile learning trends using text mining techniques to conduct a meta-trend analysis of 119 articles between 2003 and 2008. They found that many studies were about the effectiveness of mobile learning and there was also the increase of research on evaluation and systems development of

it.

Hwang and Wu (2014) reviews the 214 publications from 2008 to 2012 in seven well-known SSCI journals of technology-enhanced learning as to examine on the applications and impacts of mobile technology-enhanced learning. It is found that top four application areas were language learning, environmental and ecological education, engineering and computer education and historical and cultural education.

Krull and Duart (2017) analyzed the research themes, methods, settings, and technologies in mobile learning research under the higher education settings from 2011 to 2015. A total of 233 refereed articles were selected from peer reviewed journals. Key findings indicated that: (a) mobile learning in higher education is a growing field as evidenced by the increasing variety of research topics, methods, and researchers; (b) the most common research topic continues to be about enabling m-learning applications and systems; and (c) mobile phones continue to be the most widely used devices in mobile learning studies. However, more and more studies work across different devices, rather than focusing on specific devices.

Chee, Yahaya, Ibrahim, and Hasan (2017) examined the longitudinal trends of mobile learning research using text mining techniques in a more comprehensive manner. 144 papers referred journal articles were retrieved and analyzed from the Social Science Citation Index database selected from top six major educational technology-based learning journals based on Google Scholar metrics from 2010 to 2015. Content analysis was implemented for further analysis based on (a) category of research purpose, (b) learning domain, (c) sample group, (d) device used, (e) research design, (f) educational contexts, (g) learning outcome, (h) periodic journal, (i) country, and (j) publisher. It is found that most studies of mobile learning focused on effectiveness, followed by mobile learning review, and took samples from a higher education institution, followed by the elementary or primary school. Mobile learning frequently supported learning in the Language and Art, followed by Science. Smartphone currently is the most widely used devices for mobile learning. In addition, most mobile learning studies adopted quantitative method as the

primary research design.

In the previous trend research, most of trend analyses of mobile learning were conducted mainly with the research purpose, theme, subject, and other aspects, but there is no research on keywords and hotspots. At the same time, most of the existing research methods use meta-analysis, text analysis or content analysis by simple frequency analysis and there are a few research papers using text-mining and systematic review. Most of the analysis periods were 5-8 years, and there is no specific comparative study between countries. This study uses frequency analysis and semantic network analysis to investigate trends in mobile learning research over the past decade between Korea and China. These findings may provide insights into the mobile learning research for researchers and educators, and even policy makers.

Research Methods

Data Sources and Search Strategies

This study examines the mobile learning research papers published in Korea and China from 2009 to 2018. To collect target papers, the research uses the China National Knowledge Infrastructure (CNKI) database and Korea Research Information Sharing Service (RISS), well known as academic information database in both countries respectively. In order to ensure the integrity and credibility of the data, core journals were selected on CNKI, including CSSCI (Chinese Social Sciences Citation Index) and CSCD (Chinese Science Citation Database) levels and KCI (Korea Citation Index) and KCI candidates on RISS, using the keywords 'mobile learning' or 'm-learning.' A total of 893 articles were collected and organized with the bibliographic data including research title, author, journal name, abstract, keyword, and publication year from CNKI, so did 268 articles from RISS. After all papers were manually screened, non-academic papers such as repetitive

documents and meeting notices were excluded. Finally, 620 Chinese papers and 205 Korean papers were selected. In the whole process, both Korean and Chinese authors of this study directly selected the target papers and discussed continuously to ensure the validity as target papers.

Analysis Method

This study used two analysis methods of the frequency analysis and semantic network analysis. The frequency analysis is mainly based on the number of papers published in the year, research subjects, and research methods (See Table 1).

Table 1. Analysis criteria of frequency analysis

Criteria	Sub-Category
Publication year	2009~2018
Research subject	Preschool children
	Primary and secondary school students
	College students
	Others (general group)
Research method	Qualitative research
	Quantitative research
	Literature research
	Development research
	Mixed research (e.g. qualitative and quantitative methods combined)

This study divides the published papers into a yearly basis, that is, from 2009 to 2018 and then divided into ten units; the research subjects are mainly divided into preschool children, primary and secondary school students, college students (including university students), and general adult group appearing in the journals; the research methods are divided into qualitative research, quantitative research,

literature research, development research and mixed research. The mixed research refers to merging two or more methods.

This study firstly explored general research trend in terms of mobile learning with these three basic criteria. The three basic criteria are common categories found in precedent literature review with regard to trend analysis of mobile learning.

Semantic network analysis based on research keywords mainly uses Bicomb (Bibliographic Item Co-Occurrence Matrix Builder) and Ucinet, the professional analysis software, to analyze high-frequency words and generate visualized knowledge maps. Bicomb can read the database literature, accurately extract the keywords, and allow the user to modify and increase the system functions, then classify the storage, statistics, and generate a co-occurrence matrix of the number of data, providing comprehensive and accurate authoritative basic data for further research. (Wang, 2016). Ucinet comes with NetDraw visual analysis software that can be used to construct a common word network diagram (knowledge map). This word network diagram helps for researchers to analyze the relationship between the various keywords (Zhang & Wang, 2014).

This semantic network analysis process is shown as Figure 1.

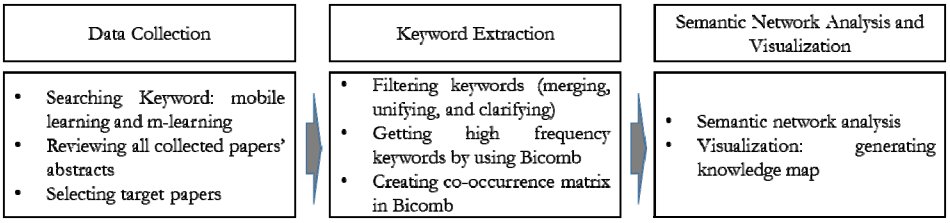

Figure 1. Process of Semantic Network Analysis

Firstly, the research determined target papers by investigating the relevance to the research purpose and declassifying unrelated papers. Secondly, research keywords were examined and refined through merging, unifying, and clarifying. Table 2 shows the keywords list cleaned in the refining process. Through this process, this study found the tendency of using research keywords in both

countries' study fields regarding the mobile learning. For incidence, Korean research papers show various keywords, including the term 'application,' to express mobile application, but in Chinese relevant research field, the term 'application' does not mean 'mobile application' or 'app' as a software. Therefore, Table 2 distinguished refined keywords depending on the use of the keywords in both countries. High frequency keywords were drawn and co-occurrence matrix were created to generate semantic network (knowledge map) by using Bicomb. Thirdly, a related knowledge map was generated from the semantic network analysis by using Ucinet.

Table 2. The list of refined research keywords

Types	Keywords in the original literature	Revised keywords	Country
Merging Similar words	mobile application, smartphone application, mobile apps, mobile web application, mobile applications, mobile device application, APP, APPS, App, Apps, app, apps, application	mobile applications	Korea
	APP, APPS, App, Apps, app, apps	APP	China
	mobile-learning, m-learning, mobile based learning, mobile education	mobile learning	Korea & China
	mobile phone, smartphone	smart phone	Korea & China
	micro-lesson, micro lesson,	micro-lesson	China
	Mooc, Moocs, MOOC, MOOCs, mooc, moocs	MOOC	China
	WeChat, Wechat platform, Wechat software	WeChat	China
Clarifying	CALL	Computer assisted language learning	Korea
	EFL	English foreign language	Korea
	MALL	mobile-assisted language learning	Korea

Research Results

Through data analysis and software processing, the following results are obtained.

Publication Year Distribution

As shown in Figure 2, in terms of the number of papers on mobile learning published in China and Korea over the past decade, the publication of research papers in both countries has been significantly increased until 2017.

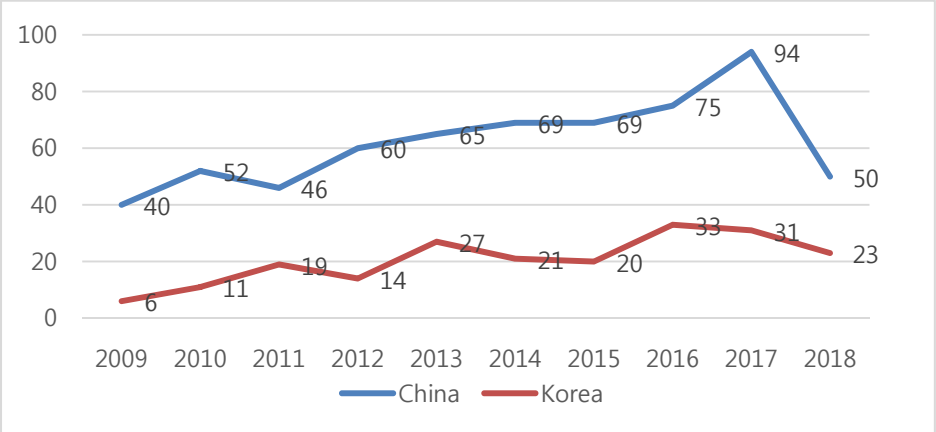

Figure 2. Distribution of Publication Year

In Korea, the peak of research on mobile learning is 2016, and China is the peak of interest in 2017. However, the publication of academic papers decreased in 2018.

Research Subject Distribution

As shown in Figure 3, two countries present a similar pattern of the distribution of research subjects.

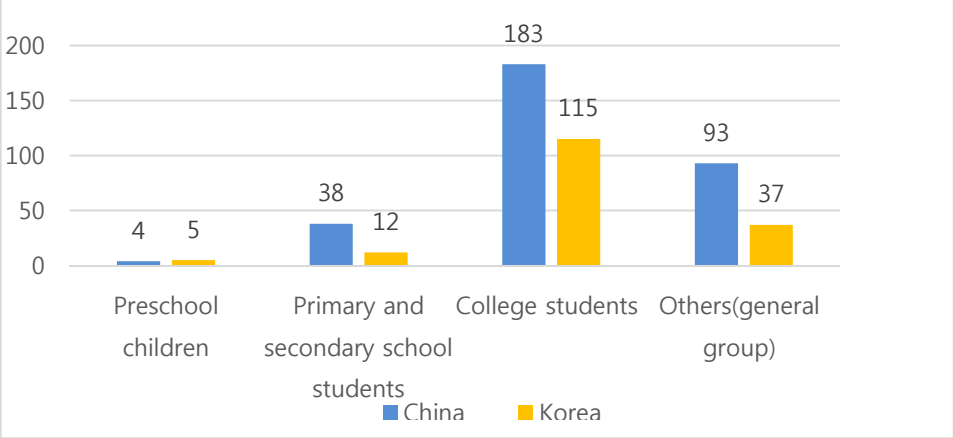

Figure 3. Distribution of Research Subjects

In both countries, there were many studies of college students, followed by 'general' adult learners. General scope of Korea included disabled people, adult learners, teachers, etc. General scope of China included minorities, medical workers, teachers, etc. In particular, the use of mobile learning in the special education of Korea is an inspiration to the relevant researchers in China. Meanwhile, in both countries, primary and secondary students have relatively low levels.

Research Method Distribution

Regarding research methods, there is some difference in the tendency of the two countries as shown in Figure 4.

In Korea, quantitative research accounts for a high proportion, but in China, literature research shows a high number. In China, there are many papers on theoretical discussions related to mobile learning. In addition, development research (e.g. research on program or course development for mobile learning) shows significant differences between Korea and China.

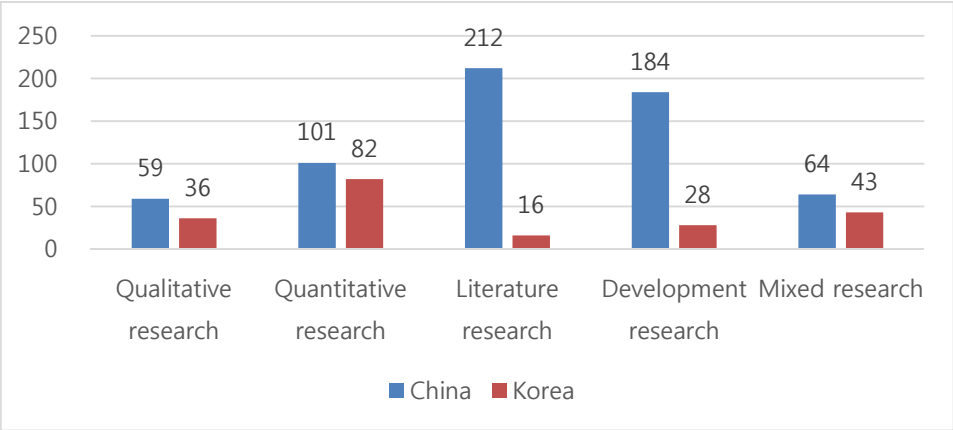

Figure 4. Distribution of Research Methods

Distribution of High Frequency Keywords

This study conducts semantic network analysis by using co-word analysis and visual network analysis of keywords, and the results are as follows. As shown in the Table 3, for Korea, the top 10 keywords are 'mobile learning,' 'mobile application,' 'mobile-assisted language learning (MALL),' 'mobile device,' 'e-learning,' 'smart learning,' 'smartphone,' 'satisfaction,' 'blended learning,' and 'vocabulary learning.' In the knowledge map, the most important connection with mobile learning is mobile language support (MALL), mobile application, smart learning, smart phone, satisfaction, and vocabulary learning.

Semantic network analysis is able to make a map representing relationships between keywords using nodes. Each node shows a keyword and its size is related with the keyword frequency. A linkage between nodes represents co-occurrence relations between keywords. According to Lin and Zhao (2018), a point centrality is used to show a linkage degree, that is, "to measure the degree of direct connection between a keyword and many keywords in a (social) network." Therefore, the higher the degree of point centrality, the more closely the nodes' relationship (Lin & Zhao, 2018).

As seen in Table 3, the values of point centrality showing the linkage degree

Table 3. High Frequency Keywords of Korea

No.	Keyword	Frequency of occurrence	Point Centrality
1	mobile learning	117	0.17
2	mobile application	35	0.047
3	mobile-assisted language learning	33	0.057
4	mobile device	21	0.024
5	e-learning	18	0.032
6	smart learning	17	0.033
7	smartphone	16	0.028
8	satisfaction	11	0.027
9	blended learning	10	0.017
10	vocabulary learning	8	0.019
11	learner perception	7	0.018
12	motivation	6	0.008
13	perceived usefulness	6	0.016
14	self-directed learning	6	0.008
15	system quality	5	0.018
16	technology acceptance model	5	0.01
17	collaborative learning	5	0.005
18	ubiquitous learning	5	0.01
19	augmented reality	5	0.006
20	mobile technology	5	0.005
21	language learning	4	0.007
22	service quality	4	0.017
23	perceived ease of use	4	0.011
24	cyber university	4	0.011
25	learning management system	4	0.006
26	information quality	4	0.017
27	self-efficacy	4	0.012
28	learning	4	0.008
29	English speaking	3	0.004
30	smart education	3	0.002

between keywords are higher in 'mobile learning (0.17),' 'mobile-assisted language learning (0.057),' 'mobile application (0.047),' 'smart learning (0.033)' than others. The

map represented by all keywords and each point centrality is shown as Figure 5.

In Figure 5, 'mobile learning' is the center of all key words. There are generally more and closer connections among the top 10 keywords with high degree of point centrality. It implies that research themes of language learning, e-learning, smart learning, and devices in terms of mobile learning are relatively common in Korea.

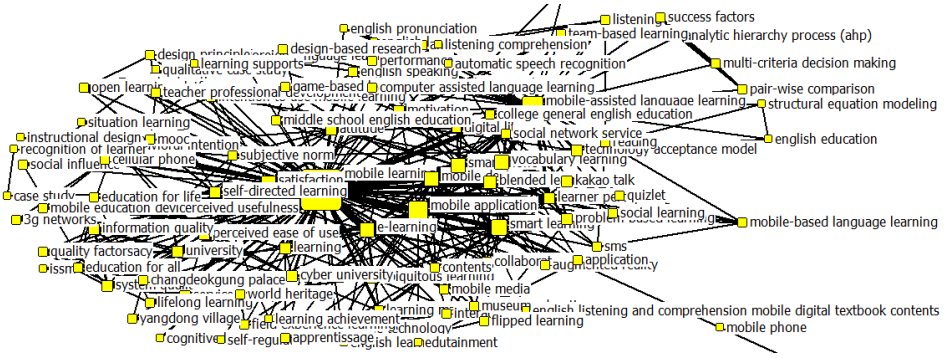

Figure 5. A map representing semantic network by research keywords in Korea

The top 10 high-frequency keywords in China are 'learning resources,' 'WeChat,' 'English learning,' 'learning platform,' 'micro-learning,' 'APP,' 'mobile devices,' 'intelligent mobile phone,' and 'college students.' It can be seen from the knowledge map that the most important connection center are learn resource, WeChat, English learning, learning platform, micro-learning. In particular, the application shows the highest connection centrality.

For China, the values of point centrality showing the connection degree between keywords are higher in 'mobile learning (0.207),' 'learning resource (0.038),' 'WeChat (0.03),' 'English learning (0.028)' than others, as shown in Table 4. The map represented by all keywords and each point centrality is shown as Figure 6. In Figure 6, 'mobile learning' is also the center of all key words like Korea's case. There are also more and closer linkage among the top 10 keywords with high degree of point centrality, and 'learning resource,' 'WeChat,' 'English learning,' 'micro learning,' and 'devices' are relatively common research themes in China. For

Table 4. High Frequency Keywords of China

No.	Keyword	Frequency of occurrence	Point Centrality
1	Mobile Learning	485	0.207
2	learning resource	62	0.038
3	WeChat	48	0.03
4	English learning	41	0.028
5	Learning platform	36	0.023
6	Micro-learning	33	0.02
7	APP	27	0.016
8	Mobile devices	25	0.014
9	smart phone	21	0.018
10	College student	21	0.013
11	Adult Education	21	0.012
12	Blended learning	19	0.013
13	Situated learning	19	0.013
14	distance learning	18	0.012
15	colleges and universities	17	0.012
16	application research	16	0.009
17	Teaching research	15	0.01
18	Internet	15	0.01
19	influence factor	14	0.008
20	cloud computing	14	0.008
21	learning environment	13	0.008
22	e-learning	13	0.009
23	learning model	13	0.01
24	Teacher	12	0.006
25	Lifelong learning	11	0.007
26	evaluate	11	0.009
27	Android	11	0.006
28	Interactive learning	10	0.006
29	Migrant workers	10	0.004
30	Foreign language education	10	0.005

China, there are differences from Korea in that WeChat, one of the most popular SNS (social network systems) in China, and English learning as a specific language learning are higher ranks.

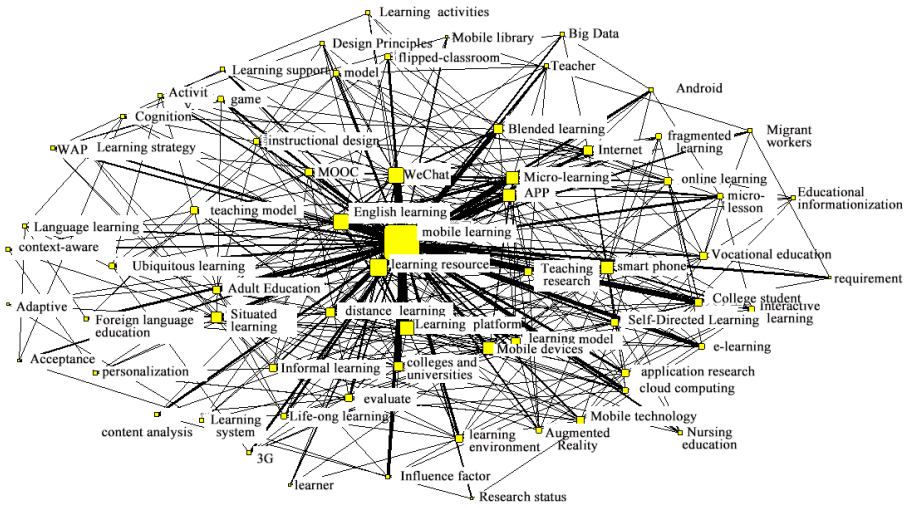

Figure 6. A map representing semantic network by research keywords in China

Conclusions and Suggestions

Conclusions

The purpose of this study was to investigate the trend of research on mobile learning through the analysis and comparison of Korea and China's academic journal papers published between 2009 and 2018 with four aspects. The following conclusions are drawn:

First, the peak period of research on mobile learning in Korea is 2016, while that in China is 2017. The peak of research concern in mobile learning is shown in Korea relatively earlier than that in China.

Second, the research on mobile learning in Korea and China is mainly targeted to higher education (college students). It can be seen that the application of mobile learning in college and university courses actively take place. In addition, there are many studies on mobile learning for teachers and adults, so it assumes that two countries are interested in applying mobile learning for professional development

and lifelong learning.

However, in certain conditions, the analysis revealed that two countries had different interests in same areas. For instance, a majority of studies in Korea are about the disabled, but the relevant issues were hardly stated in China. Also, China has a certain proportion of research on ethnic minorities and migrant workers, while Korea has not. Accordingly, for China, the research interest in mobile learning needs to extend to the field of education for the disabled. As known, special education needs more support of educational technology than ordinary school education does. In the other hand, because of rapidly moving toward a multicultural society, Korea needs to also consider the use of and study on mobile learning for learners from multicultural families, like China does for ethnic minority.

Third, differences were also found in the research methods mainly used in mobile learning academic papers in Korea and China. In Korea, quantitative research such as mobile learning effectiveness measurement was mostly conducted, but in China, literature research method was most used for theoretical discussion. In addition, one characteristic of China's research method is that it uses mobile learning related development research.

Fourth, in the semantic network analysis, the main areas of research interest were identified through the frequency of research keywords. 'Mobile learning' appeared as the main topic of interest in both countries. Also, in the subject area, contents related to the ‘language learning,’ in particular English learning, appeared to be clear. It is seen that English learning is popular learning area to primary and secondary school students as well as adult learners in both countries. Moreover, in Korea, the government policies encourage English learning linked with the mobile devices (Korea Ministry of Education, 2016) and it would also stimulate the increase of relevant research.

In other features, in Korea, concepts in the related areas appear as topics of research interest such as e-learning, smart learning, and blended learning. This certainly leads to studies on the linkage and extension among these fields. This

reflects that Korea academic society's interest in technology based teaching and learning is hot. In addition, the frequency of co-occurrence in light of research interest in 'mobile application' and 'mobile device' is relatively high in Korea. The research keyword 'mobile application' is a dominant point as a trend that is different from the situation in China. Another high research interest field in Korea is on investigating the effectiveness of mobile learning as an innovative approach. The studies in terms of 'satisfaction' and 'perception' of mobile learning are more concerned.

However, in China, the keywords 'learning resources,' 'WeChat,' 'micro learning,' etc. show the noticeable research interest. The research keywords 'learning resources' and 'WeChat' are unique points unlike Korea. It is assumed that mobile learning is a learning resource, like a book, a webpage, etc. in the research field of China. In addition to this, 'WeChat' in China is one of notably popular social networking service (SNS) and recently provides a myriad of learning programs to public. That is the reason why many Chinese researchers flock to the 'WeChat.'

Suggestions

Through the analysis of this research trend, we understood the 'mobile' research tendency of Korea and China with similar educational enthusiasm and backgrounds. Therefore, some pilot screening points and future research directions were worked out.

For Korea, it is necessary to improve the research sense of mobile services in primary and secondary schools. Empirical research such as effect measurement is relatively high, on the contrary, theoretical research or discussion on mobile view is weak. It is necessary to have a reflective discussion. From the perspective of research topics, most of the learning topics are focused on language learning, including English. It is critical to extend various research topics.

China also needs to pay more attention to mobile services in primary and secondary schools. Especially, the test spots obtained from the analysis of Korean

research tendency are not only primary and secondary education, but also the mobile use of 'special children' or 'ordinary disabled' in general groups. China needs to pay more attention to it. It is necessary to conduct analysis and research through empirical data. Research on the areas of concern also needs to go beyond language learning, such as English, to expand into a variety of areas of learning themes.

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