『津田塾大学紀要』第 52 号（2020 年）111-129 頁

Research Topics and Trends in Active Learning in Higher Education

– a Semantic Network Analysis of Research Papers from 1990 to 2018

John W. CHENG[1]

1. Introduction and background

In 2012, the Central Council for Education, an advisory board to the Ministry of Education, Culture, Sports, Science, and Technology of Japan (MEXT) published a report on the qualitative transformation of higher education in Japan (Central Council for Education, 2012). The report lays out the blueprint for the transformation, in which active learning is highlighted as one of the key elements. Since then, active learning has become a highly popular term in higher education institutions across Japan (Ito, 2017; Yamada & Yamada, 2018).

The concept of active learning –students learn by actively doing something instead of passively listening– began to attract attention in higher education in the 1990s (Ishiyama, 2010). Since then, it has evolved into different teaching methods such as flipped classroom (Alexander, 2018), problem based learning (Roche, 2016), collaborative learning (Teng, 2006), as well as utilisation of interactive classroom technologies (Holmes, Tracy, Painter, Oestreich, & Park, 2015). While many educators and scholars see active learning as a paradigm shift from traditional education, some argue that it is just another educational fad (Camp, 1996; Jacot, Noren, & Berge, 2014). Indeed, despite active learning is being widely applied, some studies, e.g., Prince (2004), Ishiyama (2010), and Halpern (2016), find that the evidence on its effectiveness is still mixed.

One possible reason behind the debate on active learning is its vague and broad definition. Active learning, in its beginning in the early 1990s, was defined as '… anything that "involves students in doing things and thinking about the things they are doing"' (Bonwell & Eison, 1991, p. 2). Thus, naturally, the main focus of active learning has been on various teaching methods that can actively engage students. However, as the scope of active learning continued to expand, it has also grown into a complex concept that includes multiple strategies, methods, pedagogies, as well as the utilisation of information technologies (Farrell, 2009).

In Japan, driven by the government's initiative, many higher education institutions have incorporated active learning into their education reform, e.g., Yamada & Yamada (2018) and Ogawa & Shimizu (2016). However, Ito (2017) points out that there is still much confusion among policy makers, researchers, and instructors on what exactly active learning is. Thus, there is a need to develop a higher level definition of the concept for it to be effectively applied in Japan's higher education transformation. Ito (2017) argues that active learning should be understood as a pedagogical methodology with clearly established contents and goals instead of just a collection of teaching methods and physical activities. Although Ito has introduced a theoretical framework helping educators to better understand the concept, currently there is still a lack of empirical studies on the concept of active learning.

With this background in mind, the aim of this study is to contribute to the understanding of the concept by quantitatively investigating what the main topics and trends in academic research on active learning in higher education are by answering the following three research questions.

RQ1. What are the main topics in research on active learning in higher education?
RQ2. What were the research trends in active learning in higher education over time?
RQ3. What are the research focus areas in active learning in higher education in different fields of study?

2. Method

This study uses a meta-analysis approach to address the research questions by quantitatively examining academic research papers on active learning in higher education. Specifically, it employs semantic network analysis, an effective tool

to uncover meanings embedded in unstructured text. Based on network science, semantic network analysis treats a set of text as a network and the words within the text as network nodes. Then by measuring the relations between the words (nodes), it can reveal latent semantic patterns hidden within the text (Drieger, 2013). This method has been used in a wide range of text-mining and content analysis studies including meta-analysis of academic literature, e.g., Lee & Moon (2017) and Feldman, Regev, Hurvitz, & Finkelstein-Landau (2003).

In this study, the text (network) consists of research papers on active learning in higher education published in academic journals from 1990, when the concept began to gain attention, to 2018. First, for RQ1, the research topics are identified by highlighting and grouping keywords within the text into clusters using co-occurrence network analysis. Next, for RQ2, the trends of the research topics over time are identified by examining the appearance frequency and importance of the research topics identified in RQ1 in different time periods. Lastly, for RQ3, the research focus areas in different fields of study are revealed by examining the appearance frequency and importance of the research topics identified in RQ1 in different fields. This study uses KH Coder 3, an open-source program that is commonly used for semantic network analysis (Higuchi, 2016).

3. Data

The dataset consists of the English titles and abstracts of research papers on active learning in higher education published in academic journals from 1990 to 2018. The papers were drawn from five major academic literature databases of different disciplines including ERIC (Education Resources Information Center)[2] for education and pedagogy, Academic Search Premier[3] and Sage Journals[4] for multidisciplinary research, SocINDEX[5] for sociology, and ScienceDirect[6] for science and medicine research. The selection criteria were papers published between 1990 and 2018 in academic journals that were indexed in these databases and had the words ‘active learning’ in their titles and ‘university,’ ‘college,’ ‘tertiary,’ or ‘higher education’ in their abstracts. Non-English papers that had an English title and abstract were also included.

In total, after removing duplicating records, 460 papers were selected. Among them, 186 (40%) were from Academic Search Premier, 182 (40%) were from

ERIC, and the rest were from the other three databases. The titles, abstracts, years of publication, and names of the journal of the papers were extracted to form the dataset. The numbers of papers published in each year are shown in Figure 1. On average, 16 papers were published per year between 1990 and 2018. It can be seen that the numbers of papers published per year were below the average until 2010. Since then, the numbers had increased sharply that 63% of the papers were published after 2010. This shows that despite active learning began to gain attention in the 1990s, research on its applications in higher education did not pick up the pace until the early 2010s.

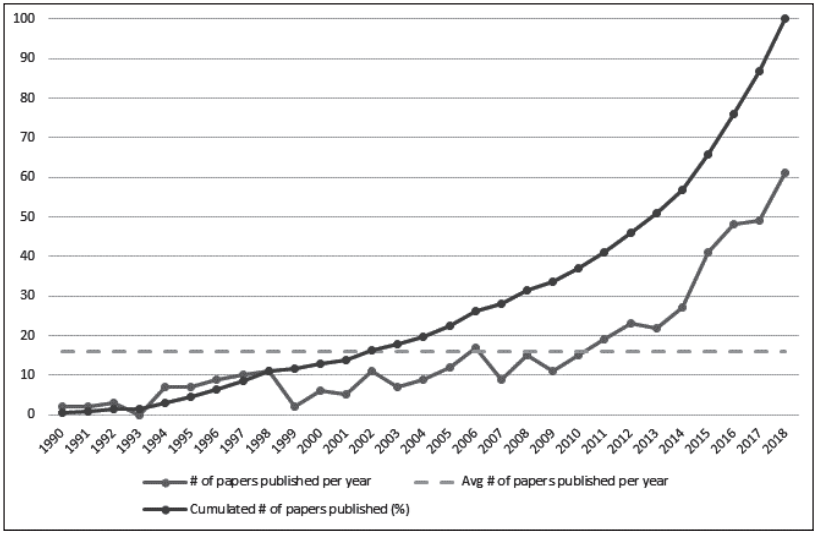

Figure 1. Number of Papers Published (1990 – 2018)

4. Result Analysis

The dataset was analysed with KH Coder 3. The search words used to select the papers from the journal databases (‘active learning,’ ‘university,’ ‘college,’ ‘tertiary’ and ‘higher education’) were excluded from the analysis to avoid double-counting. The ten most frequently appearing words[7] measured by term frequency and document frequency are listed in Table 1. It can be seen that ‘student,’ ‘course,’ ‘learning,’ and ‘study’ were the most frequently appearing words in the research papers.

	Word	Term frequency	Word	Document frequency
1	student	1610	student	394
2	course	558	learning	247
3	learning	475	course	218
4	study	358	study	197
5	classroom	357	teaching	180
6	teaching	346	result	160
7	method	300	classroom	153
8	class	284	class	149
9	education	241	approach	135
10	approach	236	method	132

Table 1. Top Ten Most Frequently Appearing Words

4.1 RQ1 Research Topics in Active Learning in Higher Education

The resultant co-occurrence network of words[8] is shown in Figure 2. The upper diagram shows the words grouped into different clusters based on their degree of modularity[9] represented by different levels of grey. The sizes of the circles represent the appearance frequency of the words and the lines between the circles represent the intensity of co-occurrence[10] between them. The lower left diagram shows the degree of centrality[11] of the words and the lower right diagram shows their degree of betweenness[12], in which the levels of the degrees are represented by the levels of grey.

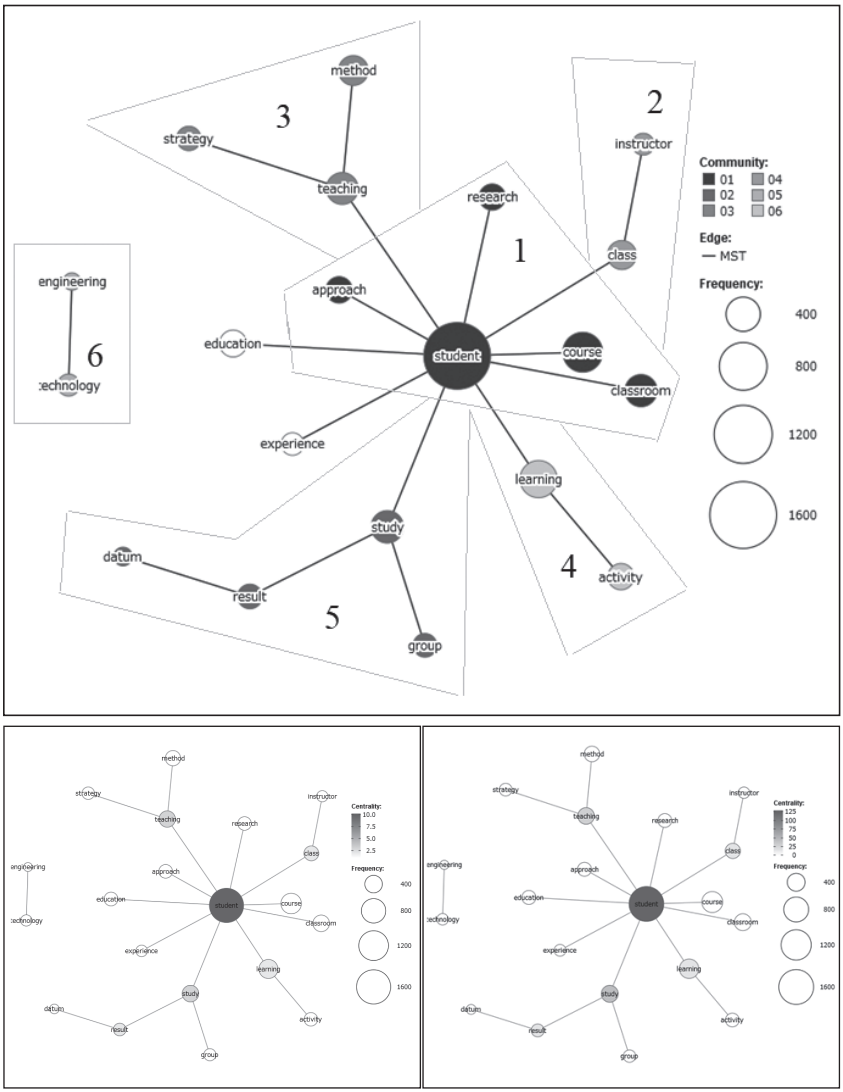

Figure 2. Co-occurrence Network of Words

The co-occurrence network of words reveals that there are six main groups of words within the text (five interconnected ones and one independent). The words of each group are listed in Table 2, in which words that had the highest appearance

frequency, degree of centrality, and degree of betweenness in their corresponding groups are classified as main keywords, while the other words are classified as keywords.

Group	Main keywords	Keywords
1	student	approach, classroom, course, research
2	class	instructor
3	teaching	strategy, method
4	learning	activity
5	study	group, result, datum
6	technology, engineering	

Table 2. Main Keywords and Keywords

4.1.1 Group 1 – Students

The main keyword of group 1 is 'student.' As shown in Figure 2, it is located at the centre of the network connecting to the other four groups. It also has the highest appearance frequency and degrees of centrality and betweenness. This implies that 'students' are the main topic in the research papers on active learning in higher education, such as students' roles, skills, performance, and approaches in active learning as shown by the following examples of papers that contain the keywords of this group (the keywords are underlined and the papers' titles are shown in italics, the same format is applied to the examples of all other groups).

Example 1. Roles of students in active learning:

> *Creating an Active Learning Environment in an Introductory Acoustics Course*
> Research in physics education has indicated that the traditional lecture-style class is not the most efficient way to teach introductory physical science courses at the university level. Current best teaching practices focus on creating an active learning environment and emphasize the students' role in the learning process. (Neilsen, et al., 2012, p. 2500)

Example 2. Performance of students in a course that used active learning:

> *"There Is No Single Right Answer:" The Potential for Active Learning Classrooms to Facilitate Actively Open-Minded Thinking*
> A description of a study on students in a fourth year psychology course is provided in which the instructor changed her course in order to use the ALC

[Active Learning Classrooms] to its fullest capacity. (Chen, 2015, p. 171)

Example 3. How students approach active learning:

A Bridge to Active Learning: A Summer Bridge Program Helps Students Maximize Their Active Learning Experiences and the Active Learning Experiences of Others

We found that Bridge students perceived that because they knew how to approach active learning and viewed it as important, they benefited more from active learning in introductory biology than non-Bridge students,… (Cooper, Ashley, & Brownell, 2017, p. 1)

Example 4. How students develop their skills from active learning:

A Hybrid Approach to Active Learning

An approach to incorporate active learning strategies into the first semester of a university-level introductory physics course. Cooperative and peer-based methods inside the classroom with project-based learning outside the classroom in an attempt to develop students' transferable skills as well as improving their understanding of physics. (Ramsier, 2001, p. 124)

4.1.2 Group 2 – Class Relations

The main keyword of the second group is 'class.' It links up with group 1 (student) and the keyword 'instructor' as shown in Figure 2. As the following examples drawn from papers that contain the keywords of this group illustrate, the topic of this group appears to be 'class relations,' especially relations between students and instructors through active learning.

Example 1. Opinions from instructors and students in a course that used active learning:

Clarity in Teaching and Active Learning in Undergraduate Microbiology Course for Non-Majors

To determine students' content understanding we used a pre-post content survey. To document the use of teaching innovative approaches in the class we interviewed all participants, including the lecture and the lab instructors and their students, to get their perspectives. (Marbach-Ad, et al., 2010, p. 3)

Example 2. How an instructor's active learning method affected students' performance:

Encouraging Active Learning Can Improve Students' Performance on Examinations

> …across 3 classes, we coded exam items according to how the instructor presented relevant materials and recorded classwide performance. Both between and within classes, students' performances were better on items testing materials covered with active learning techniques compared to other formats. These data provide empirical support for the efficacy of active learning techniques. (Yoder & Hochevar, 2005, p. 91)

4.1.3 Group 3 – Teaching Approaches

The main keyword of group 3 is 'teaching.' As shown in Figure 2, it connects to group 1 (student) and the keywords 'method' and 'strategy' within its own group. Thus, it can be assumed that the topic of this is group is about teaching methods and strategies, i.e., the 'teaching approaches' of active learning as illustrated by the following examples of papers that contain the keywords of this group.

Example 1. Using active learning as a teaching and learning strategy:

> *Active Learning across Borders: Lessons from an Interactive Workshop in Brazil*
>
> …intensive workshop was designed by the authors to introduce teaching and learning strategies and to promote critical dialogue for professors and advanced students from institutions across Brazil. (Kille, Krain, & Lantis, 2008, p. 411)

Example 2. Using specific teaching method of active learning:

> *Student Reciprocal Peer Teaching as a Method for Active Learning: an Experience in an Electrotechnical Laboratory*
>
> This teaching method is referred to in the literature as reciprocal peer teaching. In this study, the method is applied to laboratory sessions of a higher education institution course, and the students who act as teachers are referred to as 'laboratory monitors.'…This work is related to the changes in teaching methods in the Spanish higher education system,… (Muñoz-García, Moreda, Hernández-Sánchez, & Valiño, 2013, p. 729)

Example 3. The application of active learning as a teaching strategy and the methods that derived from it:

> *Active Learning Strategies and Assessment in World Geography Classes*
>
> 'This article describes several strategies that can be used in secondary- or college-level world geography courses…active approaches supplement expository teaching of standards-based geography concepts and current geographic issues. Assessment of the impact of these methods reveals the need

for ongoing guided practice in the use of these skills. (Klein, 2003, p. 146)

4.1.4 Group 4 – Learning Activities

The main keyword of group 4 is 'learning.' It links up with group 1 (student) and the keyword 'activity' as shown in Figure 2. Thus, it can be assumed that the topic of this group is 'learning activities' that are being used in active learning as illustrated by the following examples drawn from papers that include the keywords of this group.

Example 1. Effects of active learning activities:

College Experiences and Student Learning: the Influence of Active Learning, College Environments and Cocurricular Activities

…examines the impact of learning activities and college environments on learning…Student involvement in learning activities and environments that were most directly related to the learning outcomes enhanced learning… (Anaya, 1996, p. 611)

Example 2. How to apply active learning activities:

The Active Learning Continuum: Choosing Activities to Engage Students in the Classroom

A conceptual framework is provided to help college teachers find ways to include meaningful learning activities in their classes, regardless of teaching style, course objectives, or students' level of experience… (Bonwell & Sutherland, 1996, p. 3)

4.1.5 Group 5 –Study Descriptions

The main keyword of group 5 work is 'study.' It connects to group 1 (student) and the keywords 'group,' 'result,' and 'datum' as shown in Figure 2. Unlike other groups, as shown by the following examples, the subject of this group appears to be descriptions of the studies themselves, a typical pattern in academic paper abstracts, rather than a specific research topic.

Example 1. Study, data, results

Active Learning in the Online Environment: the Integration of Student-Generated Audio Files

The purpose of this study was to obtain empirical data on graduate students' perceptions of…Results indicate students were satisfied with this instructional approach. (Bolliger & Armier Jr, 2013, p. 201)

Example 2. Study, data of different groups, results

> *High Structure Active Learning Pedagogy for the Teaching of Organic Chemistry: Assessing the Impact on Academic Outcomes*
>
> In this study, the authors examine student performance data on homogeneous examinations and course grades for two groups of students at a large public university…Results suggest that… (Crimmins & Midkiff, 2017, p. 429)

4.1.6 Group 6 – Technologies

As shown in Figure 2, this group is independent from the other five and consists of two main keywords 'technology' and 'engineering.' As shown by the following examples of papers that contain these keywords, this group appears to have two topics: the utilisation of technologies in active learning and the application of active learning in STEM (science, technology, engineering and mathematics) subjects.

Example 1. Using technologies in active learning:

> *Twitter as a Teaching Practice to Enhance Active and Informal Learning in Higher Education: the Case of Sustainable Tweet*
>
> With the rise of web 2.0, a multitude of new possibilities on how to use these online technologies for active learning has intrigued researchers. While most instructors have used Twitter for in-class discussions, this study explores the teaching practice of Twitter as an active, informal, outside-of-class learning tool… (Kassens-Noor, 2012, p. 9)

Example 2. Application of active learning in STEM subjects:

> *Enhancing Students' Interest in Science and Technology Through Cross-Disciplinary Collaboration and Active Learning Techniques*
>
> …after our program, 68 % of the students indicated that they plan to pursue a major in science, technology, engineering, and mathematics (also referred to as STEM majors)… (Grant, Malloy, & Hollowell, 2013, p. 101)

4.2 RQ2 Trends of Research Topics in Active Learning in Higher Education Over Time

First, a set of Boolean logic formulae was constructed to represent the research topics identified in RQ1 based on their keywords. For example, the formula for topic 1 'students' was: 'student' AND ('approach' OR 'research' OR 'course' OR 'classroom'). Papers that fulfilled the conditions of the formula of a particular topic were considered to include that topic. For instance, referring to the above example again, if a paper has the word 'student' and either 'approach,' 'research,' 'course' or

‘classroom’ in its title and/or abstract, it is considered to include the topic ‘students.’ Following this approach, the numbers of the research topics appeared in the papers were calculated and the results are summarised in Table 3. The topic ‘study description’ (group 5) was excluded because it was related to the presentation of research papers rather than to active learning.

Topics	# of papers	% of all papers
Group 1- students	327	71%
Group 2- class relations	45	10%
Group 3- teaching approaches	101	22%
Group 4- learning activities	76	17%
Group 6- technologies	108	23%
No matching topic	68	15%
Total number of documents	460	

Table 3. Research Topics

Among the five topics, ‘students’ are by far the most prominent that it appears in 71% of the research papers. It is followed by ‘technologies’ (23%), ‘teaching approaches’ (22%), ‘learning activities’ (17%), and ‘class relations’ (10%). The sum of the topics are greater than 100% because some papers include more than one topic.

The trends of the research topics over time are shown in Figure 3, in which the sizes of the squares represent the percentage of papers that include a particular topic. The shades of the squares represent their levels of Pearson residual, a measure of the difference between the expected appearance frequency and the actual appearance frequency. In short, the darker a square is, the more likely that topic is mentioned, that is, the more important it is.

The trends in Figure 3 show that ‘students’ were the main topic in active learning in higher education in terms of both frequency and importance across almost all time periods. Other than ‘students,’ the results also show that the main research topic was ‘teaching approaches’ in early studies (1990-1994), and was changed to ‘learning activities’ in 2005-2009, and subsequently to ‘teaching approaches,’ ‘technologies,’ and ‘class relations’ in recent (2010-2018) studies. Furthermore, it can also be seen that over time, the research topics had become more diversified as

the Pearson residuals of all five topics in 2015-2018 were positive, which means that they were all relatively more important in this time period than previous ones.

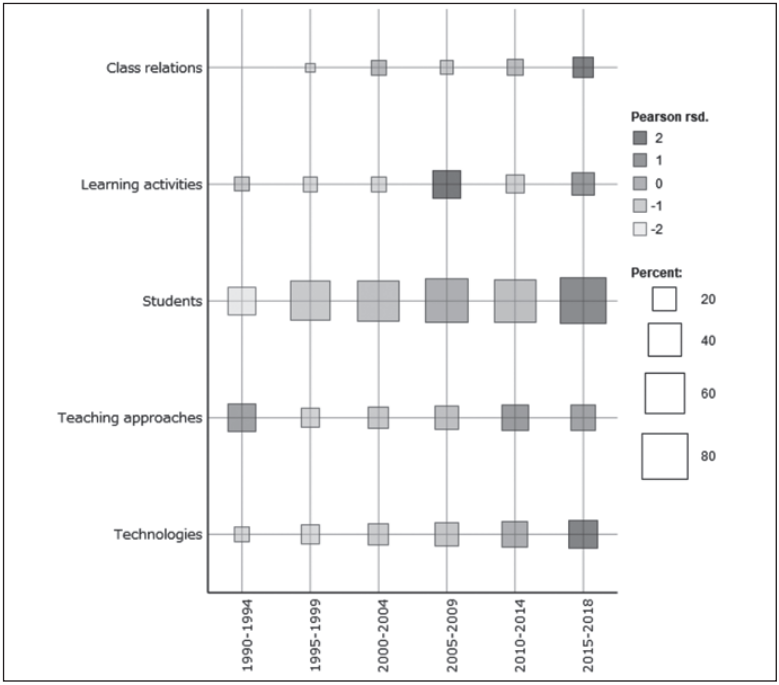

Figure 3. Crosstab Plots of Research Topics and Time Periods

4.3 RQ3 Research Focus Areas in Active Learning in Higher Education in Different Fields of Study

First, the papers were classified into different fields of study according to the primary subject areas of the journals that they were published in. In total, as shown in Figure 4, eight different fields of study were identified. Among the eight fields, as expected, education and pedagogy is the main area of study in active learning in higher education that 35% of the papers are from journals in this field. It is followed by STEM (26%), medicine and health (14%) and computer and information sciences (8%), which all are science related. One the other hand, arts subjects, such as arts and humanities, sociology and political science, and business and management, only account for 5%, 5%, and 4% of the papers, respectively. In other words, it seems that

other than in education and pedagogy, research on active learning is more popular in science subjects.

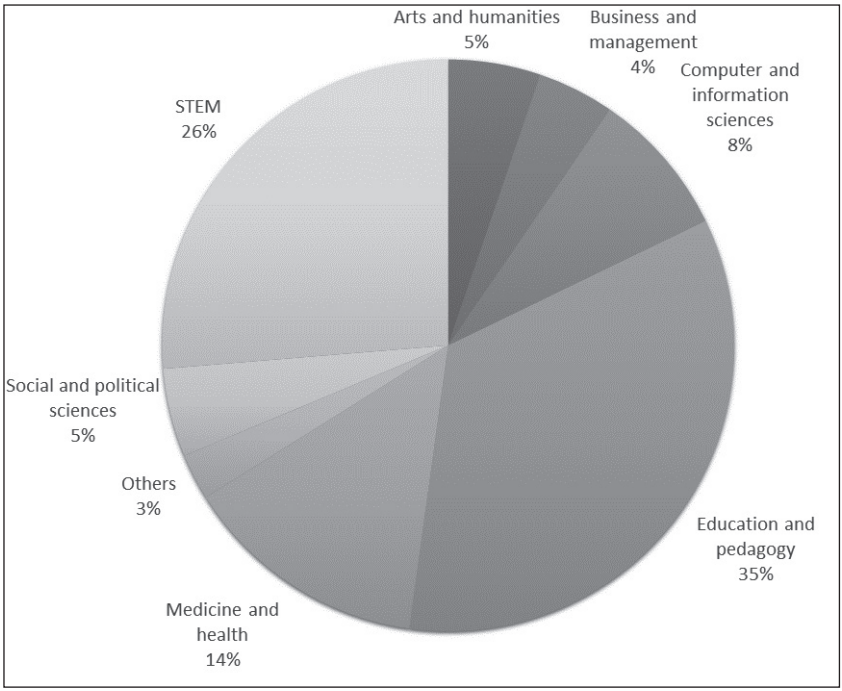

Figure 4. Fields of Study

Next, the research topics identified in RQ1 were plotted against the different fields of study in the same format as in RQ2. The results (Figure 5) show that 'students,' once again, are the main research topic. It has the highest frequency and a high importance in all eight fields of study. In addition, the results also show that in the two largest fields, education and pedagogy and STEM, the research topics are quite diversified that they cover all five topics. That said, while education and pedagogy studies focus more on 'learning activities' and 'class relations,' STEM studies pay more attention to 'technologies' and 'teaching approaches.' For the other fields, the research topics are more specific. For example, medicine and health research focuses more on 'leaning activities' and 'teaching approaches,' and computer and information science studies focus mainly on 'technologies.'

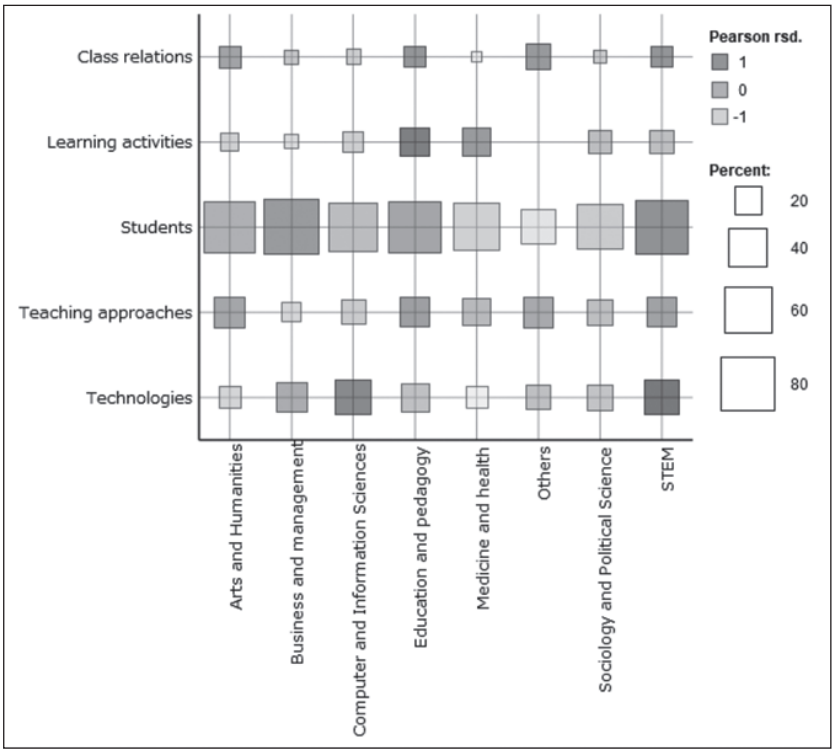

Figure 5. Crosstab Plot of Research Topics and Fields of Study

5. Discussion and Conclusion

Driven by the government's initiative, active learning has been widely adopted in higher education institutions in Japan. Yet, it still lacks a clear understanding from a higher-level perspective (Ito, 2017). This paper attempts to add to the literature by quantitatively identifying the main research topics and trends in active learning in higher education.

Based on a semantic network analysis of 460 research papers published between 1990 and 2018, first, it is found that there are five main research topics in active learning in higher education, namely 'class relations,' 'learning activities,' 'students,' 'teaching approaches' and 'technologies.' Among the 5 topics, 'students' are found to be the main research focus area across different time periods and fields of study. Second, the results have also shown that the research focus areas have

changed over time. It has evolved from ‘teaching approaches’ in the early 1990s, when the concept began to gain popularity, to ‘learning activities’ in the mid-2000s when research on active learning picked up the pace, and subsequently to ‘class relations’ and ‘technologies’ in recent (2015-2018) studies. In addition, the research focus areas have also become more diversified over time and they vary in different fields of study. For instance, in education and pedagogy, the main field of active learning research, the main focus areas are ‘students,’ ‘learning activities,’ and ‘class relations.’ On the other hand, in the field of STEM studies, the second main field of active learning research, the research focus areas are ‘students,’ ‘teaching approaches,’ and ‘technologies.’

The main implication of the findings for higher education researchers and practitioners is that, in line with Ito (2017)’s argument, active learning has evolved from a collection of teaching methods to a methodological concept with multiple focus areas. Therefore, when implementing active learning in higher education, on top of focusing on teaching and learning methods, attention should be paid to other aspects, in particular to ‘students,’ ‘class relations,’ and ‘technologies.’ In addition, it is also worth noting that among the 460 papers, only 6 were about Japan and among them 4 were written in English, and all of them were published after 2014. In other words, research on active learning in higher education in Japan aiming for the international academic community began quite late and is scarce.

Finally, this paper has some limitations that readers should be reminded of when interpreting the results. First, the data were drawn from selected databases and thus, despite they cover several fields of study, sampling bias is inevitable. Second, the dataset consists of only papers with English titles and abstracts and therefore, the results only provide a general perspective. Nevertheless, this study has established a foundation for future work, for instance, to compare the research focus areas and trends in active learning in higher education between Japanese and English research papers.

Notes

1 Assistant Professor, Department of English, School of Liberal Arts, Tsuda University. Email: cwljwc@tsuda.ac.jp.

2 Accessed via EBSCO https://www.ebsco.com/products/research-databases/eric. Last accessed, 29 September, 2019.

3 Accessed via EBSCO https://www.ebsco.com/products/research-databases/academic-search-premier. Last accessed, 29 September, 2019.

4 Accessed via https://journals.sagepub.com/. Last accessed, 29 September, 2019.

5 Accessed via EBSCO https://www.ebsco.com/products/research-databases/socindex. Last accessed, 29 September, 2019.

6 Accessed via https://www.sciencedirect.com/. Last accessed, 29 September, 2019.

7 Only nouns were used in this analysis. The plural and singular forms of a word were considered as the same word.

8 Communities: Modularity; minimum spanning tree only; number of nodes: 20; number of edges 18; density 0.095; minimum Jaccard coefficient 0.224.

9 The community structure of nodes (words) in a network.

10 Measured by Jaccard coefficients.

11 The degree of importance of a node in a network.

12 The degree of a node acting as a connecting hub for other nodes.

References

Alexander, M. M. (2018). The Flipped Classroom: Engaging the Student in Active Learning. *Journal of Legal Studies Education, 35*(2), 277-300.

Anaya, G. (1996). College Experiences and Student Learning: the Influence of Active Learning, College Environments and Cocurricular Activities. *Journal of College Student Development, 37*(6), 611-622.

Bolliger, D. U., & Armier Jr, D. D. (2013). Active learning in the online environment: The integration of student-generated audio files. *Active Learning in Higher Education, 14*(3), 201-211.

Bonwell, C. C., & Eison, J. A. (1991). *Active Learning: Creating Excitement in the Classroom. 1991 ASHE-ERIC Higher Education Reports*. Washington: ERIC Clearinghouse on Higher Education, the George Washington University.

Bonwell, C. C., & Sutherland, T. E. (1996). The active learning continuum: Choosing activities to engage students in the classroom. *New directions for teaching and learning, 67*, 3-16.

Camp, G. (1996). Problem-based learning: A paradigm shift or a passing fad? *Medical Education Online, 1*, 4282.

Central Council for Education. (2012, August 28). *Towards a Qualitative Transformation of University Education for Building a New Future - Universities Fostering Lifelong Learning and the Ability to Think Independently and Proactively.* Retrieved September 28, 2019, from http://www.mext.go.jp/en/publication/report/title01/detail01/1380275.htm

Chen, V. (2015). “There is No Single Right Answer”: The Potential for Active Learning Classrooms to

Facilitate Actively Open-minded Thinking. *Collected Essays on Learning and Teaching, 8*, 171-180.

Cooper, K. M., Ashley, M., & Brownell, S. E. (2017). A bridge to active learning: a summer bridge program helps students maximize their active-learning experiences and the active-learning experiences of others. *CBE—Life Sciences Education, 16.1*(ar17), 1-14.

Crimmins, M. T., & Midkiff, B. (2017). High structure active learning pedagogy for the teaching of organic chemistry: Assessing the impact on academic outcomes. *Journal of Chemical Education, 94*(4), 429-438.

Drieger, P. (2013). Semantic network analysis as a method for visual text analytics. *Procedia-social and behavioral sciences, 79*, 4-17.

Farrell, J. B. (2009). Active learning: theories and research. *Jewish Educational Leadership, 7*(3).

Feldman, R., Regev, Y., Hurvitz, E., & Finkelstein-Landau, M. (2003). Mining the biomedical literature using semantic analysis and natural language processing techniques. *Biosilico, 1*(2), 69-80.

Grant, D., Malloy, A., & Hollowell, G. (2013). Enhancing students' interest in science and technology through cross-disciplinary collaboration and active learning techniques. In E. Cohen, & E. Boyd. Informing Science Institute.

Halpern, R. (2016). Active Learning Works! Until it Doesn't: Measuring the Effectiveness of Activity-Based Learning Exercises on Information Anxiety. *Journal of Library & Information Services in Distance Learning, 10*(3-4), 242-253.

Higuchi, K. (2016). A Two-Step Approach to Quantitative Content Analysis: KH Coder Tutorial using Anne of Green Gables (Part I). *Ritsumeikan Social Science Review, 52*(3), 77-91.

Holmes, M. R., Tracy, E. M., Painter, L. L., Oestreich, T., & Park, H. (2015). Moving from flipcharts to the flipped classroom: Using technology driven teaching methods to promote active learning in foundation and advanced masters social work courses. *Clinical social work journal, 43*(2), 215-224.

Ishiyama, J. (2010). What is the impact of in-class active learning techniques? A meta analysis of the existing literature. *APSA 2010 Annual Meeting Paper*, 1-15.

Ito, H. (2017). Rethinking active learning in the context of Japanese higher education. *Cogent Education, 4*(1298187), 1-10.

Jacot, M. T., Noren, J., & Berge, Z. L. (2014). The flipped classroom in training and development: Fad or the future? *Performance Improvement, 53*(9), 23-28.

Kassens-Noor, E. (2012). Twitter as a teaching practice to enhance active and informal learning in higher education: The case of sustainable tweets. Active Learning in Higher Education. *Active Learning in Higher Education, 13*(1), 9-21.

Kille, K. J., Krain, M., & Lantis, J. S. (2008). Active learning across borders: Lessons from an interactive workshop in Brazil. *International Studies Perspectives, 9*(4), 411-429.

Klein, P. (2003). Active learning strategies and assessment in world geography classes. *Journal of Geography,*

102(4), 146-157.

Lee, S., & Moon, H. (2017). Semantic Analysis of Transportation Related Researches. *2017 IEEE International Congress on Big Data (BigData Congress)* (pp. 545-548). Honolulu, HI, USA: IEEE.

Marbach-Ad, G., McGinnis, J. R., Pease, R., Dai, A. H., Schalk, K. A., & Benson, S. (2010). Clarity in Teaching and Active Learning in Undergraduate Microbiology Course for Non-Majors. *Bioscene: Journal of College Biology Teaching, 36*(2), 3-9.

Muñoz-García, M. A., Moreda, G. P., Hernández-Sánchez, N., & Valiño, V. (2013). Student reciprocal peer teaching as a method for active learning: An experience in an electrotechnical laborator. *Journal of Science Education and Technology, 22*(5), 729-734.

Neilsen, T. B., Strong, W. J., Anderson, B. E., Gee, K. L., Sommerfeldt, S. D., & Leishman, T. W. (2012). Creating an active-learning environment in an introductory acoustics course. *The Journal of the Acoustical Society of America, 131*(3), 2500-2509.

Ogawa, N., & Shimizu, A. (2016). Current State of Educational Reform and Approaches to Active Learning in NIT, Gifu College. *Procedia Computer Science, 96*, 1400-1408.

Prince, M. (2004). Does active learning work? A review of the research. *Journal of engineering education, 93*(3), 223-231.

Ramsier, R. D. (2001). A hybrid approach to active learning. *Physics Education, 36*(2), 124.

Roche, M. A. (2016). PBL trigger design by medical students: An effective active learning strategy outside the classroom. ,. *Journal of clinical and diagnostic research: JCDR, 12*, JC06.

Teng, L. Y. (2006). Infusing a Collaborative Learning Curriculum to Enhance Active College Learning. *College Quarterly, 9*(3), n3.

Yamada, A., & Yamada, R. (2018). The New Movement of Active Learning in Japanese Higher Education: The Analysis of Active Learning Case in Japanese Graduate Programs [Online First]. In *Active Learning - Beyond the Future* (pp. 1-16). IntechOpen.

Yoder, J. D., & Hochevar, C. M. (2005). Encouraging active learning can improve students' performance on examinations. *Teaching of psychology, 32*(2), 91-95.