

A Study on the Influence of Community-Based Education on Post-University Workers and Its Time Dependence

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Abstract

This study identified the long-term effects of community-based education on a university laboratory that conducts "community-based education," a form of university education in collaboration with the local community. Ninety-three graduates from their first to 16th year in the workforce were asked in a descriptive format whether their learning through activities in the community had been useful to them as members of society. A dataset was created from the free-writing responses of graduates and analyzed using the Structural Topic Model (STM). Five topics were extracted. For the graduates of the laboratories surveyed, the usefulness of learning through activities in the region during their university years can be summarized by these five topics. Multiple regression analysis was conducted on these topics, with the proportion of topics as the dependent variable and the number of years since graduation and the degree of involvement with the regional community as independent variables. The results showed that Topic 4 was significantly dependent on the number of years since graduation, and Topic 3 also showed a significant trend. In addition, Topics 1 and 3 were significantly dependent on the degree of involvement in the community during the respondent's university years, and Topic 2 showed a significant trend.

Keywords: University students, community-based education, graduates survey, topic model

1 Introduction

Students learning through community activities is known as service learning [1]. Community-based education, in line with the concept of service learning, has taken root in Japanese universities. Many universities offer courses in which students go out into the community and conduct fieldwork as a regular course of study. Practical activities with local residents lead to learning for students [2], but the debate on the educational effects of community-based education has not been highly active. This may be because in Japan, the spread of community-based education has been promoted as a national policy, focusing on improving the local employment rate. In this context, one of the studies on educational effects, Nakazato et al. [3], found that immediately after taking a service-learning course, students received more support from local residents in acquiring citizenship, which contributed to the establishment of those students' emotional regulation skills. However, this measure was effective for students immediately after they took the service learning course. Education also has long-term effects on students. Examining the effects from a long-term perspective is important to understand the significance of communi-

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ty-based education. Nakazato et al. [4] examined the long-term effects of community-based education on graduates of a university laboratory that had developed practical activities in a regional community. In this survey, graduates from the first to 16th year after graduation from the target laboratory were asked how their experience of activities in the community during their student years had been useful to them after becoming working adults, and their free-writing responses were analyzed. Because this was a preliminary, simplified study, a more rigorous analysis is required. This study examined the free-writing responses from graduates in detail and analyzed the carefully pre-processed dataset using the Structural Topic Model (hereinafter referred to as "STM"). Through this analysis, we examined how university students are affected by community-based education after graduation.

2 Survey Samples and Results

2.1 Survey samples

2.1.1 Laboratory surveyed in this study

A laboratory in the Social Science Department of a public university in Japan was the subject of this study. About 12 students per academic year belong to this laboratory. The seminar begins in the second semester of the second year (from October to March of the following year), and students receive guidance from the same academic teacher for two and a half years until graduation.

This laboratory has conducted activities in the community since March 2007 and has graduated from students (16 years after graduation). The subjects of this study were graduates from March 2007 and later. In March 2010 (13th year after graduation), the students began active fieldwork and actively engaging with local residents to solve local problems. In some cases, fieldwork is conducted over a long period by groups organized by student volunteers, whereas in other cases, it is conducted over a short period by all students in the same year. Individual graduates have varying degrees of fieldwork experience. Owing to the COVID-19 pandemic beginning in 2020, students graduating in March 2021 (second year after graduation) and March 2022 (first year after graduation) participated in activities with local residents online, and students at this time did not have the opportunity to conduct fieldwork.

Table 1: Assignments addressed by students in the surveyed laboratories

Assignments		
(1) Basic skills acquisition	(4) Book production	(7) Community activities (all students)
(2) Video production	(5) Planning and management for university festival	(8) Community activities (volunteers)
(3) Article production	(6) Planning and management for laboratory alumni association	(9) Graduation research

Table 1 lists the assignments that the students worked on in the target laboratory. (1) Basic skill acquisition takes place in the second semester of the second year and first semester of the third year. To acquire basic skills, there were multiple assignments to learn the basics of paper media design, video production, and research and interviewing skills, and each assignment was allotted a period of approximately one month. All students worked on these tasks. These were followed by assignments such as "(2) Video production," "(3) Article production," and "(4) Book produc-

tion," which all students work on in groups over a period of several months for assignments that publish their results outside the laboratory. In addition, all students were assigned roles in "(5) Planning and management for the university festival" and "(6) Planning and management for the laboratory's alumni association" with the purpose of fostering event planning and management skills. There were two types of activities within the local community: "(7) Community activities (all students)," in which all students worked together for a short period, and "(8) Community activities (volunteers)," in which volunteer teams worked together for a year or more. "(9) Graduation research" is a project in which all students work individually for approximately one year, but not all of them are active in the community. The assignments with the highest degree of community involvement are "(8) Community activities (volunteers)" and "(9) Graduation research." In both assignments, the students worked closely with local residents through community activities.

2.1.2 Graduate survey

A questionnaire survey was administered to 172 graduates with graduation dates ranging from March 2007 (16 years after graduation) to March 2022 (1 year after graduation). The survey asked Question 1, "Do you think you learned about the region through the seminar activities?" Graduates who answered "yes" to Question 1 were then asked "Through which activities did you learn about the region?" as Question 2, allowing multiple choices from the nine assignments shown in Table 1. After Question 2, we asked Question 3, "What have you learned about the region, and what have you learned that has been useful to you as a member of society?" Respondents were asked to answer this question in free-writing form. The online survey was conducted in December 2022.

Not all students in the surveyed laboratory had the same degree of involvement with the regional community. There were differences in their involvement with the regional community. Differences in the degree of community involvement may have affected their learning in the respective community. To examine this point, we asked their teacher to rate the degree of each graduate's involvement in the community. Graduates who were deeply involved in the community were classified as level 5, and those who were not involved at all were classified as Level 1. The evaluation process was repeated by the teacher until the results stabilized. The survey was conducted in January 2023.

2.2 Survey Results

Of the 172 participants, 148 responded to the survey (86% response rate). Respondents were evenly distributed between the ages of 22 and 40 and ranged from newcomers just starting out in the workforce to graduates in mid-level or higher positions in their workplaces.

For Question 1, 123 graduates responded that they "had" learned about the region through the assignments they worked on as students. This corresponded to 83.1% of the respondents, and most graduates of the laboratory believed that they were involved with the community during their school years. A total of 123 graduates provided free-writing responses to Question 3.

For the 123 respondents who answered that they learned about the region, the results of Question 2 for options (1) through (9) in Table 1 show that "(9) Graduation survey" was selected by the largest number of graduates, with a selection rate of 50.0%. The next most common choice was assignment (8), selected by 28.4% of respondents. The next most selected items were (2) at 15.5% and (1) at 13.5%, whereas the other items were selected by less than 10% of the respondents. Graduates tended to select assignments (8) and (9) more

often for Question 2. These two assignments involved continuous fieldwork under a certain theme in the same area for 10 months in the shortest case and nearly two years in the longest case. This suggests the importance of continuous community activities to realize learning even after graduation.

3 Analysis Method

3.1 Visualization of the learning gained through activities in the community

Question 3 of the survey involved free-writing texts about the learning gained through community activities and how it has helped them become members of society. These texts were used to visualize their learning. An STM is a method for analyzing text data that do not have a structure, such as free writing. The structural topic model is an extension of this topic model [5]. The topic model estimates the topics based on textual data. It does not allow for correlation among topics. Furthermore, it does not allow for the setting of covariates. An STM allows for these analyses, which are not possible with topic models: it allows for the existence of covariates related to topic prevalence and topic content [6]. The STM can be estimated by incorporating the number of years since graduation and the degree of involvement with the community, which are assumed to be covariates. In this study, multiple regression analysis was conducted to clarify the relationship between the number of years since graduation and degree of involvement with the community, which were assumed to be covariates, and the rate of occurrence of the topics. The stm package in R [7] was used as the analysis tool.

3.2 Preparing for dataset

The analysis was based on free-writing texts of 123 respondents. Free-writing texts are not suitable for analysis as is and require careful preprocessing. For example, among the 123 free-writing texts, we found very simple answers, such as “No idea” or “Nothing in particular.” This may be because the respondents felt that they had learned something but were unable to verbalize it concretely or because they did not feel that it was particularly useful at the time of their response. There was also a simple response in which only “All” was written. This may indicate that all of the learning from the community activities was useful. These short responses were not considered appropriate as descriptions of learning in the region and were, therefore, excluded from the analysis. After carefully reviewing each graduate's description, 93 valid graduates were selected for final analysis. For these 93 graduates, the teacher ratings for their degree of involvement with the community were as follows: Level 5: 16, Level 4: 35, Level 3: 21, Level 2: 6, and Level 1: 15. The graduates analyzed were not highly biased with respect to the degree of their involvement in the community during their school years. It is important to mention that the analysis was based on free comments from a diverse range of graduates, without bias toward any particular level.

Morphological analysis of 93 free-writing texts by Mecab [8] yielded 1,077 words. These words were checked by the authors against freewriting texts, and the text data were pre-processed by deleting unnecessary free descriptions, registering them in a dictionary, and processing stop words and shaky notations.

In some cases, the freewriting texts included phrases that were clearly irrelevant to the questions. Because these phrases were not the target of this analysis, parts of the phrases that were clearly irrelevant to the questions were deleted from the free-writing texts of the four respondents concerned. For dictionary registration, a list of 63 words was registered as a Mecab user dic-

tionary to accommodate words that could not be processed by Mecab, such as unique expressions. For stop words, in addition to one personal name, three words that were difficult to interpret and could not be excluded by part-of-speech designation, including “(,” were registered. The fluctuations in notations include those caused by kana-kanji conversion and those caused by synonyms. For each type of shaking, we identified a corresponding word group and assigned a unique word to represent it. Some words in the free-writing text entries were clearly misspelled by the respondent (e.g., "move" and "transfer"—these words are the same sounds, “idou,” in Japanese) and were corrected directly. In addition, as a process related to notation, we deal with words that were extracted as the same word but had different meanings in the morphological analysis. For the word "region," which appears frequently in the text, we found from an examination of the free-writing texts that some words refer to physical fields and some words refer to people in the region. The data were modified in such a way that these concepts were separated into two words, "region (field)" and "region (resident)," to fit the meaning of the description. The data were then registered in the dictionary as forced-extraction words so that they could be extracted as words.

From the above pre-processed data, 253 words were extracted from among those used by two or more people for words classified as nouns, verbs, adjectives, adverbs, and unknown words that were not classified as numbers, suffixes, pronouns, or non-independent words in the sub-classification. Words with different part-of-speech classifications but the same character string were treated as the same word. For these 253 words, STM estimation was conducted based on a dataset containing data on the number of occurrences of each word in freewriting texts, metadata on the number of years since graduation, and degree of involvement in the region in freewriting texts. All analyses were conducted in Japanese, with the final notations converted into English words.

3.3 Consideration of number of topics

When estimating the STM, it is necessary to determine the number of topics. This study examined the held-out likelihood and residual dispersion as evaluation indices to determine the

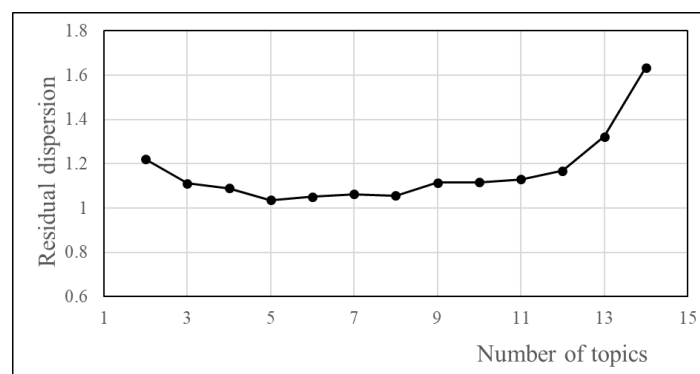


Figure 1: Calculation result of evaluation index “residual dispersion”

number of topics. By calculating each index, we found that the held-out likelihood significantly changed each time the calculation was repeated, rendering it unsuitable as an evaluation index. However, the residual dispersion remained stable. Figure 1 shows the residual dispersion when the number of topics varied from two to 14. From Figure 1, we determined that five topics (re-

sidual dispersion=1.04) were appropriate.

4 Results of Analysis and Discussion

4.1 Topics discussed by graduates as they learned in the community

The results of topic extraction using STM are presented in Table 2. The five topics in Table 2 are those that graduates who had experienced community-based education in the laboratory under study discussed when presented with Question 3.

The labeling of topics was examined by the authors by referring to the content of free-writing texts that contained a high percentage of the most frequently occurring words for each of the four indicators—Highest Prob, FREX, Lift, and Score—and the corresponding topics. These four indices are as follows: "Intuitively, Highest Prob is the group of words estimated to have the highest probability of occurrence for each topic, FREX is the group of words that characterize the topic, Lift is the group of words that are particularly likely to appear on the topic, and Score is an index similar to the TF-IDF for frequency information, which ranks all the top-ranked word groups for which the topic distribution is taken into account" [9]. Based on this, topic labels were primarily named with reference to FREX word groups.

Topic 1 concerned the attitudes that graduates acquired by talking to a variety of people in the community. In the free-writing text of one graduate with a high proportion of Topic 1 text (proportion of Topic 1: 0.87), he wrote, "I have experienced the importance of talking with customers many times. I think being able to listen with interest would be one of my strengths." This indicates that the skills related to Topic 1, which the respondent learned through community activities as a student, were utilized in their work as a member of society.

Topic 2 was the graduates' narrative on how the experience of working with local members of society (local residents) to solve real-world problems was utilized after they entered the workforce. As a specific example, one of the graduates with a high proportion of Topic 2 text included in the free-writing text (proportion of Topic 2:0.85) described the following: "The part where I grasp the thoughts and issues of local people and discuss with them whether we can solve them through the program is similar to what I did when I was a student."

All activities in the region conducted by the laboratory were group activities involving not only students but also members of the local community and their teacher. Topic 3 is the experience that graduates gained as members of society through their experience of failing such group activities when they lacked reporting, communication, and consultation. One of the graduates' free-writing text contained a high proportion of Topic 3 text (proportion of Topic 3: 0.92), including the following: "The importance of careful reporting, communication, consultation, and planning... I thought it was especially important when dealing internally as well as externally, as it relates to trust issues." This description highlights the importance of internal and external communication in working cooperatively with others.

In the free-writing text of the graduates with a high proportion of Topic 4 text (proportion of Topic 4: 0.88), one of the graduates stated that the experience of learning "the difficulty of discovering, communicating, and disseminating charms and treasures that local residents are unaware of" enabled him to "create a training program among his group companies and create opportunities to rediscover the charm of his company." The experience of conducting fieldwork in the community, discovering local attractions that were overlooked by local residents, and visualizing them in the outside world during their student days proved useful when they uncovered and visualized issues while working as members of society.

Table 2: Extracted topics

Topic	Proportion	FREX: Frequently occurring words	Label
1	0.238	listen, customer, thought, person, talk, content, job	importance of listening to others
2	0.224	solution, task, Prefecture A(*), region (resident), know, can, good	experience of solving problems with local people
3	0.162	successful, local, student years, work, giving and taking, teacher, especially	importance of reporting, contacting, and consulting (communication)
4	0.187	attraction, how, society, thing, feel, use, change	experience of discovering and visualizing local attractions
5	0.189	look, be, few, find, activity, sightseeing, City B (*)	deep understanding of the local community

(*) Anonymize the name of the municipality

Topics 1 through 4 are descriptions of what has been useful in working as a member of society since graduation. In contrast, Topic 5 describes the fact that the participants gained a deeper understanding of the community through the opportunities they had while being involved in the community, that they had to see the actual conditions of the community, and that they found local resources on their own. One of the free-writing texts with a high proportion of Topic 5 text was, "Even though a region is a single word, each region has various characteristics (specialties, tourism resources, industries, financial resources, etc.), and each one is very different from the others." The proportions of each topic in this statement were as follows: Topic 1:0.04, Topic 2:0.07, Topic 3:0.04, Topic 4:0.04, and Topic 5:0.80. That is, it almost exclusively discusses Topic 5. If we refer to this graduate's free-writing text, we can say that Topic 5 is the topic of the first half of Question 3 in the survey, "What I learned about the region."

4.2 Dependence of topics on years since graduation and teacher evaluation

We analyzed the relationship between the proportion of the occurrence of the five selected topics, the number of years since graduation, and the degree of involvement in the community during the participants' student years. The degree of community involvement was based on the results of teacher evaluations. Multiple regression analysis was conducted assuming a linear regression model, with the proportion of topic occurrence as the dependent variable and the number of years since graduation, "Year," and the degree of involvement with community, "Level," as independent variables. The results are summarized in Table 3.

Table 3 shows that Topic 4 is significantly dependent on the number of years since graduation and that Topic 3 tends to be significant. Topic 4 describes activities to discover local attractions and formulate the discovered attractions so that others can understand them. Table 3 shows that these experiences are important for graduates who have been in the workforce for a longer period. As they become more experienced in the working world, they tend to emphasize the discovery and visualization skills (Topic 4) that they have learned in the community, while they tend to emphasize communication skills (Topic 3) when they are new to the working world and inexperienced. The results indicated that the usefulness of Topic 4 in terms of skills acquired through learning in the community as a student and Topic 3 as a trend varied with years of working experience.

Table 3: The results of regression analysis (*p<0.1, **p<0.05)

Topic 1	estimate	std.error		Topic 2	estimate	std.error	
(Intercept)	0.488	0.121	**	(Intercept)	0.309	0.080	**
Year	-0.008	0.009		Year	0.001	0.006	
Level	-0.056	0.025	**	Level	-0.030	0.017	*

Topic 3	estimate	std.error		Topic 4	estimate	std.error	
(Intercept)	0.078	0.092		(Intercept)	-0.042	0.101	
Year	-0.012	0.007	*	Year	0.018	0.007	**
Level	0.060	0.020	**	Level	0.024	0.022	

Topic 5	estimate	std.error	
(Intercept)	0.167	0.086	*
Year	0.002	0.006	
Level	0.002	0.019	

The topics that significantly depended on the degree of involvement with the community as a student were Topics 1 and 3. There was also a significant trend for Topic 2. All community activities in this laboratory were conducted in collaboration with others. Because graduates who were deeply involved in the community were more likely to collaborate with residents, it is clear that such graduates emphasized topic 3, which is related to communication skills, as something useful in the working world. In contrast, graduates who were not deeply involved in the community placed more importance on listening to others (Topic 1). Topics 1 and 3 are related to communication skills. Topic 3 is considered a more complex skill than Topic 1, which is group communication. These results suggest that graduates who are deeply involved in the community acquire more complex communication skills and believe that they have been able to make use of them as members of society.

Finally, Topic 5 is a topic that is not dependent on both variables. This topic describes what participants learned about the region and does not include the element that it helped them in any way as a member of society. It is reasonable to assume that this did not depend on the number of years since graduation. The fact that this did not depend on the degree of involvement with the community during their school years indicates that all graduates described this topic to the same extent. This is also a reasonable result, given that the first half of Question 3 in the survey was in the form of a question inquiring as to what they learned in the community.

5 Conclusion

To investigate the long-term effects of community-based education, a survey was conducted on graduates of university laboratories who were active in the community through fieldwork and other activities. A detailed analysis was conducted on the free-writing answers to the question "What have you learned about the community, and are the lessons you learned useful for you as an adult?" The following five topics were extracted as useful after graduation: Topic 1 (importance of listening to others), Topic 2 (experience of solving problems with local people), Topic 3 (importance of reporting, contacting, and consulting [communication]), Topic 4 (experience of discovering and visualizing local attractions), and Topic 5 (deeper understanding of the local community).

Multiple regression analysis was conducted with the proportion of occurrence of the five topics as the dependent variable and the number of years since graduation and the degree of involvement with the community as a student as the independent variables. The results revealed

that Topic 4 significantly depended on the number of years since graduation and that Topic 3 had a significant trend. In addition, Topics 1 and 3 were significantly dependent on the degree of involvement in the community during the participants' school years, and Topic 2 had a significant tendency. Graduates who were more involved in the community during their university school years were found to place more importance on Topic 3, whereas those who were not were found to place more importance on Topic 1.

Previously, it has not been clear how community activities during student years affect graduates in the long term. Although this study was limited to a single university laboratory, it revealed one aspect of the long-term impact of community-based education. However, since this is a survey of a single point in time, there are certain limitations to the discussion of educational effectiveness in this paper in this regard.

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