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Learning about Diversity, Equity, and Inclusion (DEI) through accessibility lectures

A comparative study of learning among peer support students and general students

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This study examined learning based on the principles of Diversity, Equity, and Inclusion in Kyushu University's three Frontier Courses [Introduction to Barrier-Free Support (IBFS), Universal Design Research (UDR), and Introduction to Accessibility (IA)]. It then compared the learning differences between peer support (PS) students and general students (GS). The contents of reports submitted by students on each course were analyzed using text mining with KH Coder. The results revealed that IBFS was structured to teach Diversity while UDR focused on Inclusivity and IA emphasized Equity, which demonstrated the significance of learning these concepts across the courses. Furthermore, students were demonstrated to gain an understanding of disability in relation to themselves across all three courses. Moreover, comparisons between PS and GS revealed that the former exhibited a higher orientation toward the removal of social barriers aligned with the social model. This suggests the significance of experiential learning through PS activities.

1. Introduction

In recent years, a global push toward the advancement of Diversity, Equity, and Inclusion (DEI) education has occurred. In Japan, momentum toward the realization of an inclusive society increased following an announcement by the Ministry of Education, Culture, Sports, Science and Technology's titled "Promoting Special Needs Education to Build an Inclusive Education System for Creating a Coexistence Society."¹ Furthermore, following the ratification of the Convention on the Rights of Persons with Disabilities in 2014, legal frameworks have been established to safeguard the rights of people with disabilities.

In higher education institutions, the 2016 Act on the Elimination of Discrimination Against Persons with Disabilities and its 2021 amendments made reasonable accommodations a legal obligation. This provision rapidly accelerated the development of support systems for persons with disabilities at universities and other institutions. Against this backdrop of social and legal trends, the demand for building inclusive campuses and ultimately realizing an inclusive society is growing.

Within this context, DEI education that targets university students is gradually expanding. However,

research concerning which specific learning outcomes and shifts in awareness students gain through DEI education remains lacking. Therefore, this study focused on accessibility-related courses offered at Kyushu University, Japan. By analyzing reports submitted by students enrolled in these courses, the study sought to organize and clarify the characteristics of their learning from a DEI perspective. It also focused on the learning of peer support (PS) students, who aim to improve campus accessibility, by examining the relationship between lectures and PS activities and considering their significance.

1.1. Lectures and DEI Aimed at Raising Accessibility Awareness:

The concept of DEI evolved from the Civil Rights Act of 1964, which was enacted in the United States to prohibit racial discrimination. “Diversity,” the first principle, involves the recognition of and respect for differences in people’s identity, such as their race, sex, ethnicity, age, and ability. “Equity,” the second principle, emphasizes fairness and the provision of equal opportunities tailored to people’s individual needs. “Inclusion,” the third principle, refers to all individuals feeling valued, respected, and fully integrated into the organizational environment.² Various initiatives have been undertaken in educational institutions, corporations, and elsewhere based on these three principles.³ When considering DEI, the perspective of the social model—which aims to improve accessibility (e.g., ease of use, participation, and approachability) through the removal of social barriers—is indispensable.

In 1974, the distinction between “impairment” and “disability” was noted by the Union of the Physically Impaired Against Segregation. Impairment refers to a state that results from a person’s physical functional limitations, whereas disability refers to barriers that arise in a society that excludes people with such functional limitations. The aforementioned social model builds on this distinction by asserting that society creates disability and has gained prominence in recent years.⁴ The model emphasizes the need to address and remove underlying social barriers that constitute the root cause of disability. In the Act on the Elimination of Discrimination Against Persons with Disabilities, these social barriers are defined as encompassing not only physical aspects, services, and systems but also psychological and cultural aspects, including people’s awareness and attitudes. Removing such social barriers therefore requires not only environmental improvements but also improvements to individuals’ awareness and attitudes.

Lectures and training raise people’s awareness of accessibility. In its Second Summary on Support for Students with Disabilities, the Ministry of Education, Culture, Sports, Science, and Technology (2017) highlighted the importance of “training and deploying personnel to support students with disabilities” and “promoting training and understanding.”⁵ The Summary states that these initiatives are effective in university education for not only professionals and university staff but also students without disabilities. This underscores how DEI education in university settings holds significance for cultivating individuals who are capable of providing understanding and support in a society.

Lectures for university students often primarily target an understanding of disability. Takahashi et al. (2020) conducted lectures themed around intellectual and developmental disabilities, using accessible topics like “Film × Disability” and “Art × Disability” as entry points for the students.⁶ When the authors examined changes in students’ perceptions and images of intellectual disability before and after the lectures, their findings

suggested that the students developed a greater interest in individuals with intellectual disabilities and began to perceive disability as more relatable and personally relevant. Additionally, Kato (2022) reported that through classes that included sports practice with individuals with intellectual disabilities, students shifted their perception of disability from an “abstract other” to a more tangible other within the context of their own relationships.⁷ These examples demonstrate that students’ understanding of disability deepens through experiential learning, not just through classroom instruction. However, these practices tend to focus on specific types of disabilities, which potentially limits the breadth of students’ learning. A perspective is required that views disability not merely as a matter of welfare or education but also through the lens of accessibility across various specialized fields. Embodying these perspectives, the present study examined accessibility-related courses offered as *Kikan* (literally “root”) education subjects at Kyushu University.

The university’s *Kikan* curriculum was introduced in 2014. *Kikan* Education transcends the traditional concept of liberal arts education and constitutes a coherent educational framework designed to cultivate *Kikan*—the mental habits and attitudes associated with learning how to think and learn. These capacities enable students to continue learning autonomously from the beginning of their enrollment through undergraduate and graduate studies.⁸ Specifically, by replacing traditional lecture-centered instruction with student-participatory, experiential classes that prioritize each student’s individual questions, the curriculum seeks to cultivate proactive learning and foster active learners capable of creatively and critically identifying and solving problems.⁹ Within *Kikan* education, accessibility-related courses are positioned as frontier subjects within the category of “Comprehensive Subjects.” Such subjects aim to leverage the university’s strengths as a comprehensive institution by fostering students’ acquisition of diverse knowledge across different fields and cultivating their problem-solving abilities with a broad perspective. Therefore, these accessibility-related lectures are considered not only to equip a broad range of students with knowledge and skills regarding disabilities but also to enable them to acquire an interdisciplinary perspective that encourages them to re-examine disability, accessibility, and social barriers across various fields of study.

The accessibility-related lectures fall under the following three courses: Introduction to Barrier-Free Support (IBFS), Universal Design Research (UDR), and Introduction to Accessibility (IA). First, IBFS focuses on DEI principle of disability. It aims to deepen students’ understanding to promote social participation among diverse individuals through the provision of knowledge and experiential learning concerning various social barriers in each disability category. Thus, the IBFS course is rooted in understanding diversity by promoting the comprehension of people with varied backgrounds. Second, UDR aims to cultivate a global perspective grounded in flexible knowledge and thinking through deepening students’ understanding of how to build a “universal design” (UD) society across various specialized fields. It concerns the DEI principle of “inclusivity” as it involves the learning perspectives necessary for creating social environments in which everyone can participate and thrive, considering individual backgrounds and circumstances across diverse activity fields. Finally, IA aims to cultivate professionals who are able to enhance accessibility for diverse users. It focuses on deepening students’ understanding of information accessibility, the acquisition of assistive technologies, and their application in daily life. Thus, the IA course’s contents are closely related to the DEI principle of “equity”

as they focus on the establishment of and support for environments in which everyone can access information fairly.

Thus, the three courses provide learning opportunities from the perspective of DEI and align with the principles of DEI education. The primary objective of this study was to comprehensively understand the actual learning outcomes of students enrolled in the three courses from a DEI perspective.

1.2. Accessibility Awareness Among Peer Supporters:

This section introduces the concept of PS students, who constitute part of the target audience for the three courses. PS refers to “a system where student peers readily offer consultation and assistance to fellow students who require support in their student life”.¹⁰ At Kyushu University, the Support Section for Inclusion provides consultation for disability support and manages PS activities. It “seeks to ensure that all the members of Kyushu University respect the rights of people with disabilities and strives to eliminate any barriers (social barriers) that infringe those rights and promote efforts to put in place a learning environment that enables people with disabilities to demonstrate their individuality and abilities.” In addition to offering accessibility-related lectures, the Support Section for Inclusion works to improve physical, informational, institutional, and psychological accessibility on campus and trains PS students in supporting students with disabilities.¹¹ The presence of PS students is considered to contribute not only to ensuring an understanding disabilities and support for individuals with disabilities but also to creating an inclusive environment across the entire university as well as enhancing students’ personal growth.¹²

One requirement for students to engage in activities as PS students is that they must have completed, or be scheduled to complete, at least two of these courses. In other words, many PS students participate in PS activities while concurrently enrolled in the aforementioned courses. Based on PS reports, Omodaka et al. (2018) highlighted that PS students deepened their understanding of barrier-free environments and UD, as well as of the connection between their own specialized fields and UD, by relating these concepts to themselves.¹³ Furthermore, Kai et al. (2018) examined changes in awareness among PS students with no prior contact with persons with disabilities after taking a particular course.¹⁴ The authors found that deepening these students’ knowledge about disabilities and social barriers led to a shift toward a social model perspective. Thus, while PS students gain various insights through lectures, they also engage in more practice-oriented activities. Guided by the principle of removing social barriers on campus, these activities include information support using PC note-taking or sign language, mobility support (e.g., wheelchair guide help), direct support for students with developmental disabilities, and indirect support (e.g., the creation of barrier-free maps). Consequently, the learning that PS students gain through the interplay between lectures and practice grounded in the social model may qualitatively differ from that gained by general students (GSs). However, previous studies have often solely focused on the effects of lectures, and no research has compared the learning of PS students with that of GSs. Therefore, the secondary objective of the present study was to examine qualitative differences in learning between PS students and GSs.

In sum, this study broadly examined the actual learning outcomes of students across all courses from a DEI perspective. It also investigated how the learning differed between PS students and GSs. Through an

examination of these aspects, new significance for DEI education was expected to be identified, including PS activities, through the synergistic effects of lectures and practice activities based on the social model.

2. Methods

This section presents the methods employed to conduct the study. Section 2.1 presents the target data, Section 2.2 describes the analytical methods, and Section 2.3 highlights the ethical considerations.

2.1. Target Data:

This study examined reports submitted by students for each session of the three courses conducted from 2020 to 2024. Each course is a quarter-based course. IBFS was offered in the spring semester (mid-April to early June), UDR in the summer semester (mid-June to early August), and IA in the fall semester (early October to late November). Each course was consisted of seven sessions, and one report assignment was required after each session. The report assignments included in this study were limited to those that required students to do the following: to state their thoughts from their own role or position; to describe what they had learned from lectures or experiences; to identify social barriers and propose solutions; or to express their own thoughts based on an impactful keyword. For example, assignments where students were given a common keyword and asked to research it, or tasks that required specific correct answers (e.g., identifying barriers in scenarios with low accessibility) were excluded as they diverged from this study's core focus of capturing students' own learning. Furthermore, while the IBFS course included an LGBTQ+-themed session, LGBTQ+ no longer falls under the

Table 1: Course Structure for IBFS

	Course Overview	2020	2021	2022	2023	2024
Visual Disabilities*	Learn the basics of visual disabilities and barriers.	1**, 2 (Materials)	1	3	2	6
Hearing Disabilities	Learn the basics of hearing disabilities and barriers. Some sessions include observing real-time computer note-taking.	–	6 (Online)	6	4	7
Physical Disabilities	Learn the basics of physical disabilities and barriers. Some sessions include wheelchair experiences touring the campus.	3, 4 (Video)	2, 3	1	1	2
Health-related Disabilities	Learn the basics of health-related disabilities and barriers.	5 (Video)	4 (Online)	4	3	3
Psychosocial disabilities	Learn the basics of psychosocial disabilities and barriers.	6 (Video) Conducted jointly with Neurodevelopmental Disabilities	5 (Online) Conducted jointly with Neurodevelopmental Disabilities	5	5	5
Neurodevelopmental Disabilities	Learn the basics of neurodevelopmental disabilities and barriers.	6 (Video) Conducted jointly with Psychosocial disabilities	5 (Online) Conducted jointly with Psychosocial disabilities	2	6	1
LGBTQ+ individuals	Learn the basics of LGBTQ+ issues and barriers. Includes pre-assignments and	7 (Video)	7 (Online)	7	7	4 (Materials)

*Based on the social model of disability, the term “disability” was used in the English notation. **Numbers indicate the order of implementation. *** “Materials” refers to implementation using on-demand materials, ‘Video’ refers to implementation using on-demand videos, and “Online” refers to implementation in an online format.

category of “disability” according to DSM-5.¹⁵ Therefore, as IBFS aims to deepen students’ learning based on knowledge of various disabilities, sessions with an LGBTQ+ theme were excluded from the study. Based on these inclusion criteria, the study’s analysis included reports from 172 PS students and 958 GSs for IBFS, 208 PS students and 2829 GSs for UDR, and 216 PS students and 1264 GSs for AI.

Regarding the lecture format, to prevent the spread of COVID-19, all IBFS lectures in 2020 were delivered via on-demand materials and videos; all UDR lectures were delivered online; and IA lectures utilized on-demand materials and online lectures. In 2021, all three courses included both online and in-person lectures. From 2022 onward, lectures were conducted primarily in-person. The structure of each course is presented in Tables 1–3:

Table 2: Course Structure for UDR

	Course Overview	2020	2021	2022	2023	2024
UD	Learn the fundamentals of UD.	1* (Online**)	1 (Online)	1	1 Conducted jointly with Design	–
Design	Learn UD through everyday design.	–	2 (Online)	2	1 Conducted jointly with UD	6
Urban and Architectural Studies	Learn UD through urban spaces and architecture.	2 (Online)	–	–	–	–
Engineering	Learn based on UD implementation initiatives at Kyushu University.	–	3 (Online)	3	–	5
Liberal Arts	Learn UD through the concepts of “freedom” and “rights.”	3 (Online)	–	–	–	–
Law	Learn about UD through various laws, systems, and everyday rules.	4 (Online)	4 (Online)	4	7	2
Higher Education	Learn UD through university support, classes, and admissions.	5 (Video)	5 (Online)	5	6	7 Conducted jointly with Anthropology
Art	Learn UD from the perspective of the arts (fine arts, theater, etc.). Some sessions include discussions.	6 (Online)	6	6	3	3
Anthropology	Learn UD from cultural anthropology. Conduct a workshop involving actions with eyes closed.	7 (Online)	7 (Online)	7	5	7 Conducted jointly with Higher Education
Welfare Sociology	Learn UD from trends like declining birthrates and smaller family sizes.	–	–	–	4	4
Service Dogs	Learn UD from the role and acceptance of service dogs. Conduct a demonstration with actual service dogs.	–	–	–	–	1

*Numbers indicate the order of implementation. ** ‘Video’ refers to implementation using on-demand videos, and “Online” refers to implementation in an online format.

Table 3: Course Structure for IA

	Course Overview	2020	2021	2022	2023	2024
Mock Lesson	Attend a low-accessibility mock class and consider barriers.	1* (Online**)	1 (Online)	1	1	–
Information Accessibility (Visual)	Learn accessibility through visual information.	2, 3 (Materials)	–	–	–	4
Information Accessibility (Auditory)	Learn accessibility through auditory information.	–	2, 3 (Online)	2	2	1 (Video)
Color Universal Design	Learn color universal design from the diversity of color perception.	4, 5 (Online)	4, 5	4, 5	4, 5	3
ICT	Learn UD through the use of ICT technology.	6 (Online)	7	7	7	7
AI, IOT	Learn UD through AI camera operation and IoT technology.	7 (Online)	6	6	6	6
Sign	Learn UD from visual signs (displays, pictograms, etc.).	–	–	3	3	2
Information Science	Learn UD from the perspective of information data.	–	–	–	–	5

*Numbers indicate the order of implementation. ** “Materials” refers to implementation using on-demand materials, ‘Video’ refers to implementation using on-demand videos, and “Online” refers to implementation in an online format.

2.2. Data Analysis:

To objectively and exploratively reveal the overall picture from the large-scale data, this study employed the text mining technique. Text mining offers advantages in terms of objectivity and the ease of data exploration.¹⁶ For the analysis, the quantitative text analysis tool KH Coder (Ver.3.Beta.03; Higuchi, 2023) was used, while morphological analysis was performed using MeCab.

All reports were written in Japanese, and the analysis was conducted on Japanese-language data. The analysis began with the morphological analysis, which involved breaking down text data from each student report into the smallest possible units—namely words—by part of speech. Next, to extract any words that were not registered in KH Coder, forced extraction terms were identified, examples of which include the names of specific disabilities and various barriers as well as proper nouns like “COVID-19,” “reasonable accommodations,” and “color universal design.” Note that while “障害” was written as “障がい” or “障碍” in some cases, the intent behind each student’s spelling was unclear; therefore, the spelling is standardized as “障害” in this paper.

Next, for each course, to illustrate the connections between words with strong co-occurrence relationships, co-occurrence network diagrams were produced. Paragraphs were analyzed as the unit of analysis in each document. Considering the differing numbers of documents per course, the minimum occurrence count was set to 235 for IBFS, to 650 for UDR, and to 250 for IA. The Jaccard coefficient was used as an indicator of co-occurrence strength. For the top 100 words with a strong co-occurrence, only the minimum spanning tree was

drawn.

Next, to quantitatively compare the learning of PS students and GSs, coding rules were created based on the content of each subgraph obtained from the co-occurrence networks for each course. Then, a chi-square test using a cross-tabulation table was performed, in which paragraphs were the unit of analysis.

2.3. Ethical Considerations:

The participating students were informed in advance that any comments they made during lectures and their report assignments might be used for research purposes to enhance future educational content. When these data were used, any comments that could be used to identify individuals were excluded.

3. Results

This section presents the results of this study. Section 3.1 describes the co-occurrence network diagrams for each of the three courses, while Section 3.2 presents a comparison of learning between PS students and GSs.

3.1. Co-Occurrence Network Diagrams for Each Course

Table 4 presents details of the data analyzed for each course. Based on these data, co-occurrence network diagrams were created for each of the three courses, where the node size indicated the word frequency.

Table 4. Descriptive Statistics for Analyzed Terms

	IBFS	UDR	IA
Number of people (total)	1,130	3,037	1,480
PS students/GSs	172/958	208/2,829	216/1,264
Number of sentences	12,591	40,337	11,181
Number of paragraphs	1,160	6,228	2,630
Total extracted words (number of words used)	401,856 (153,042)	1,288,268 (483,825)	375,989 (142,387)
Number of distinct words (number of words used)	9,718 (8,731)	15,099 (13,752)	8,992 (8,096)

The results obtained for each course are described as follows: First, for the IBFS course, six subgraphs were presented (Figure 1). The term that occurred most frequently was “myself” from Group 04. It appeared in statements such as “I hadn’t realized this before,” which reflected an understanding of one’s past or present self; “I wish I could be in a position to support people with disabilities too”; “I thought most disabilities had nothing to do with me,” which indicated reflections on one’s relationship with disability; and “a psychosocial disability is hard for others to notice” and “it’s just that others don’t notice,” which concerned others’ awareness. Next, related to Group 02 from the term “myself,” references were made to the necessity of various supports in the lives of people with different disabilities as well as the need to address relevant problems. Statements

included the following: “I didn’t know about information barriers” and “the very belief that I won’t interact with people with physical disabilities unless I take proactive action might itself create a psychological barrier.” References were also made to various barriers (physical, institutional, and psychological), including information barriers that affect people with disabilities and those around them. Additionally, some students used the term “social barrier,” with statements including the following: “I felt a social barrier because I couldn’t spend time with classmates due to illness” and “a social barrier faced by people with internal disabilities or health-related disability is the lack of flexible learning or working options.” These statements demonstrated a greater awareness of social participation.

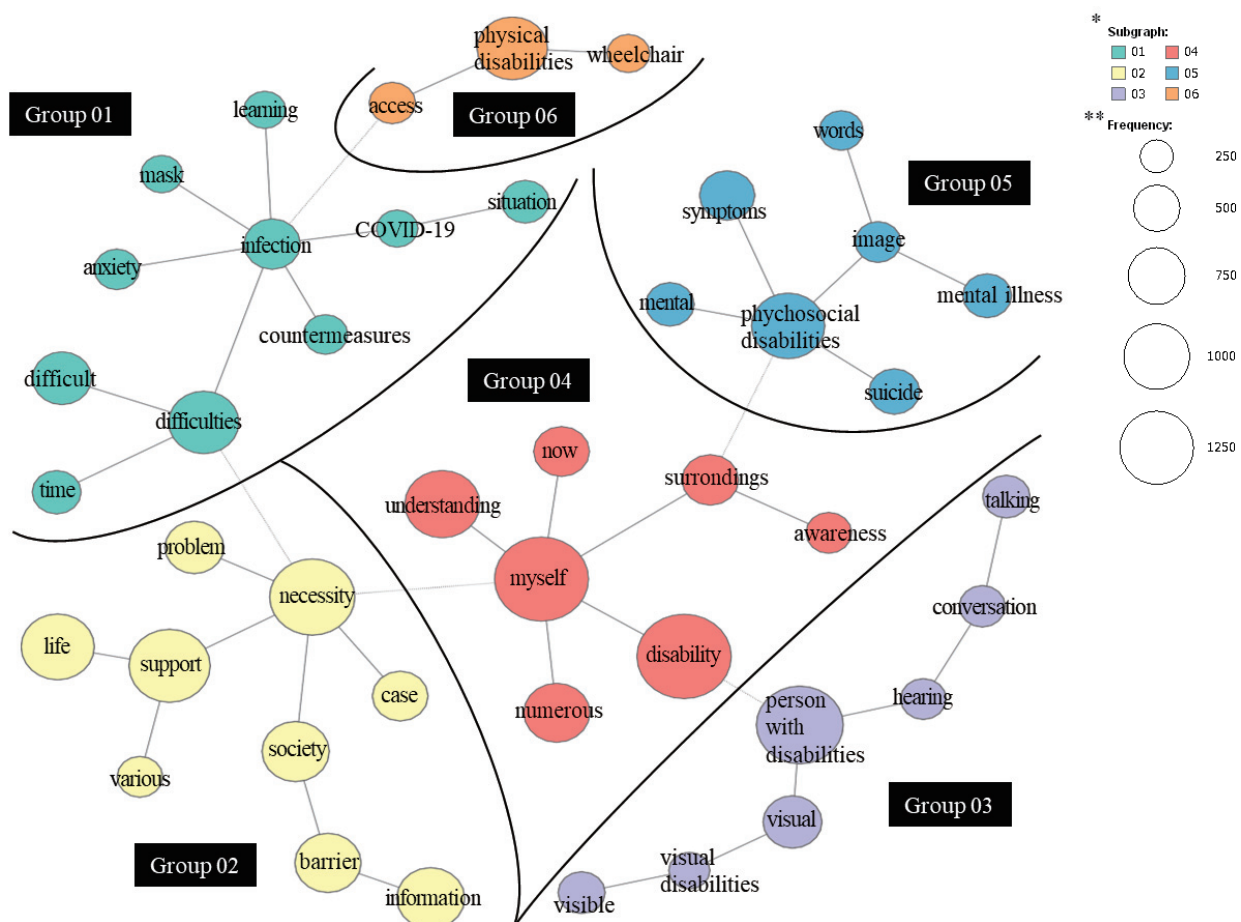


Figure1 IBFS's Co-occurrence Network

*Refers to a cluster formed by grouping words that exhibit strong co-occurrence relationships.

** Indicates the number of times each word appears in the text. Words with higher frequency are represented by larger nodes (circle).

Next, in the other groups, networks formed around more specific terms. In Group 01, content centered on “COVID-19”, with mentions of “infection,” “countermeasures,” and “anxiety” about infection during the pandemic, as well as “learning opportunities” related to the shift to online classes. Regarding such learning opportunities, many students described the barriers experienced due to online learning, with the following being among the relevant statements: “I thought that I could learn at my own pace with online classes, but as time passed, I became anxious that it was turning into self-centered learning.” Additionally, under “difficulties,” some students mentioned time-related constraints, with statements including the following: “I couldn’t adjust

my commute time” and “[When I broke my bone] assignments took an incredibly long time.” Related to Group 01, Group 06 mentioned barriers in the use of facilities like buses, ramps, and toilets for people with physical disabilities or wheelchair users. Next, in Group 03, the term “person with disabilities” led to discussions about “visual” and “hearing” disabilities, with statements including the following: “how low-vision individuals see varies from person to person” and “using LINE could make it easier for individuals with hearing disabilities to join conversations.” Finally, in Group 05, discussions centered on psychosocial disabilities, with students mentioning negative perceptions, such as viewing people with such disabilities as “unusual” or as “people who are dangerous to interact with.” However, some statements also reframed these perceptions with neutral views, such as “they are close to us and could happen to anyone.” Additionally, many comments highlighted an awareness of the impact of words, such as “I felt the weight of words” and “even words not meant to hurt can be extremely painful for the recipient.” There were also numerous mentions of the suicide rate among people with psychosocial disabilities.

Based on the above findings, the IBFS course can be stated to focus on learning about the barriers that occur in one’s own environment, the importance and challenges of support for these barriers, and how one is personally involved, using specific types of disabilities as the central axis.

Second, for the UDR course, 10 subgraphs were presented (see Figure 2). First, Group 01 was formed around the term UD, which included references to the “necessity” and “importance” of achieving UD, UD being present in “life,” the need to create and understand “living environments that are easy for everyone” as well as “inclusive” environments, and design that is easy for everyone to use. In Group 04, physical design elements were mentioned, such as having “facilities” that are accessible to “wheelchair” users, installing “toilets” that are designed for diverse users, and installing tactile paving. Next, the discussion moved from UD to Group 05’s theme of “society,” which focused on realizing spaces and societies that are easy for everyone to use, thereby meeting the needs of various “minority” groups. The opinions expressed included the importance of “listening to minority opinions” and “understanding their needs,” and that “for minority individuals to express their opinions without hesitation, everyone should recognize that being a minority is not inherently negative.” Meanwhile, Group 08 connected UD to “problems,” mentioning societal “challenges” and the difficulty of “solving” them, including “barrier-free conflicts” and “the difficulty of defying natural conditions.” Regarding the solutions to such challenges, Group 06’s discussion on barrier-free design in urban and architectural fields was relevant.

Next, centered around the term “person with disabilities,” participants in Group 02 gained insights into their past and present selves, such as in the following statements: “I realized that excessive consideration can actually be perceived as unpleasant, and that I had been judging solely based on my own values” and “what should be done to achieve UD? I cannot provide that answer myself at this time.” Expressions like “having a disability” and “able-bodied” person as a counterpart to “person with disabilities” were also observed. The term “disability” led Group 03 to discuss “support,” particularly school support for students with disabilities who attend mainstream schools. Relevant statements included the following: “How much support can schools provide for students with disabilities to attend regular classes alongside other students?” and “it’s not good to

completely segregate people with and without disabilities, like in regular schools versus special needs schools.” Finally, as distinct groups, Group 07 made broad references to students with disabilities in universities; Group 09 discussed “laws” and “systems” (“establishing laws is important for promoting UD” and “we tend to become indifferent to systems that people find restrictive”); and Group 10 mentioned blindness and differences in visual perception, which encompassed not only functional blindness but also concepts like “invisible barriers” and “invisible diversity.”

The results for the UDR course indicated that, centered around the concept of UD, core learning involved the fostering of an awareness of realizing everyday UD rooted in social life. This was achieved through various perspectives, such as architecture, law, and the presence or absence of visibility, while the challenges and difficulties encountered in its implementation were also highlighted.

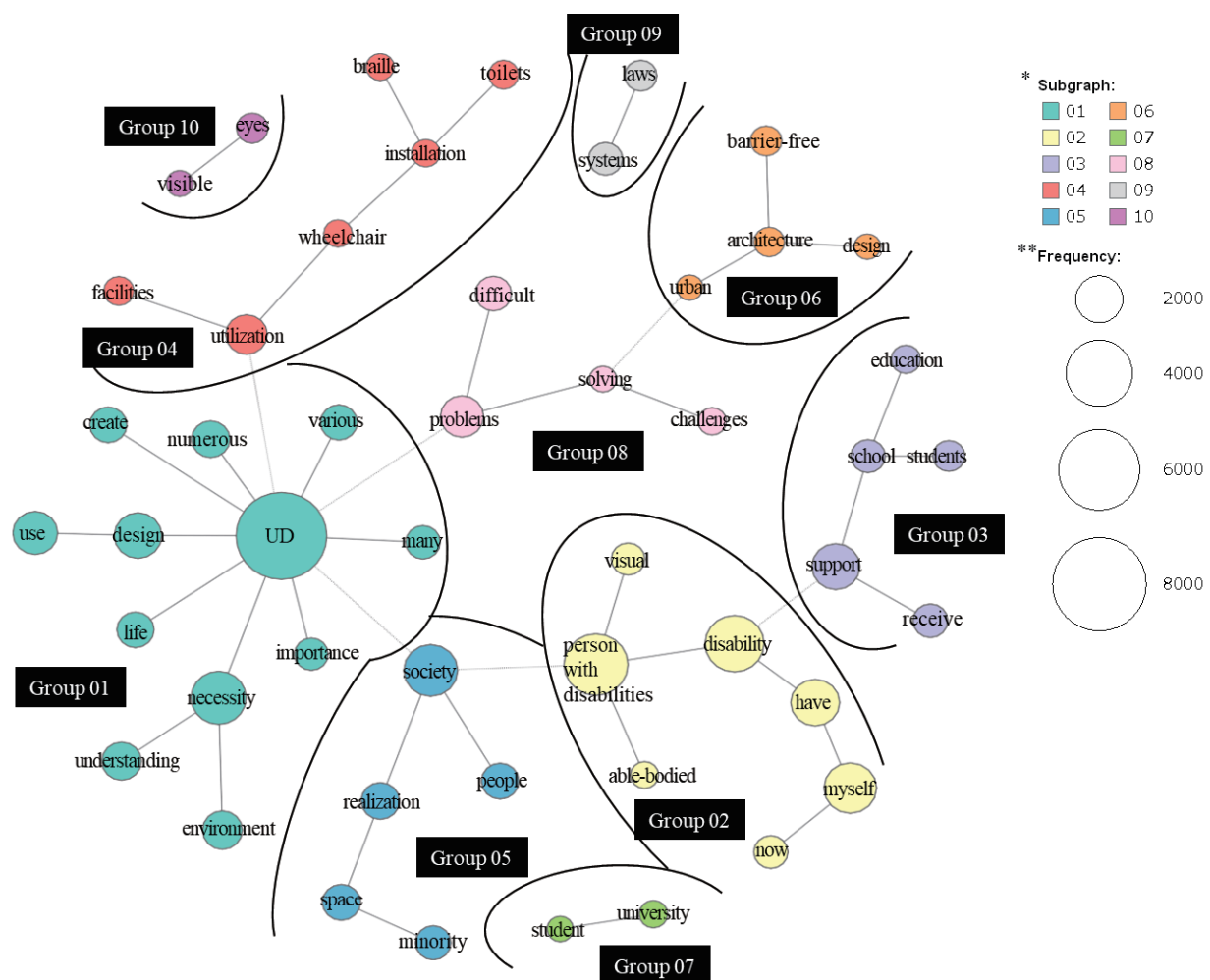


Figure2 UDR's Co-occurrence Network

* Refers to a cluster formed by grouping words that exhibit strong co-occurrence relationships.

** Indicates the number of times each word appears in the text. Words with higher frequency are represented by larger nodes (circle).

Finally, for the IA course, six subgraphs were obtained (Figure 3). Centered around the terms “disability” and “person with disability” in Group 01, broad references were made to “individuals with visual disabilities and hearing disabilities” as well as to the relationship between people with disabilities and those around them, such as in the following statements: “The defendant’s view that ‘persons with disabilities only bring misfortune

to those around them’ is mistaken” and “it was mentioned that it’s difficult for people with disabilities to force sign language on others, but that’s likely due to a lack of understanding from those around them.” References to the relationship between the self and disability were also made, such as in the following statements: “My awareness of disability within myself has changed” and “we tend to take ourselves for granted and perceive disability as something different and alien from ourselves.” Next, the term “disability” was connected to Group 03’s term “necessity” in a discussion of the need for and importance of “support” and “understanding.”

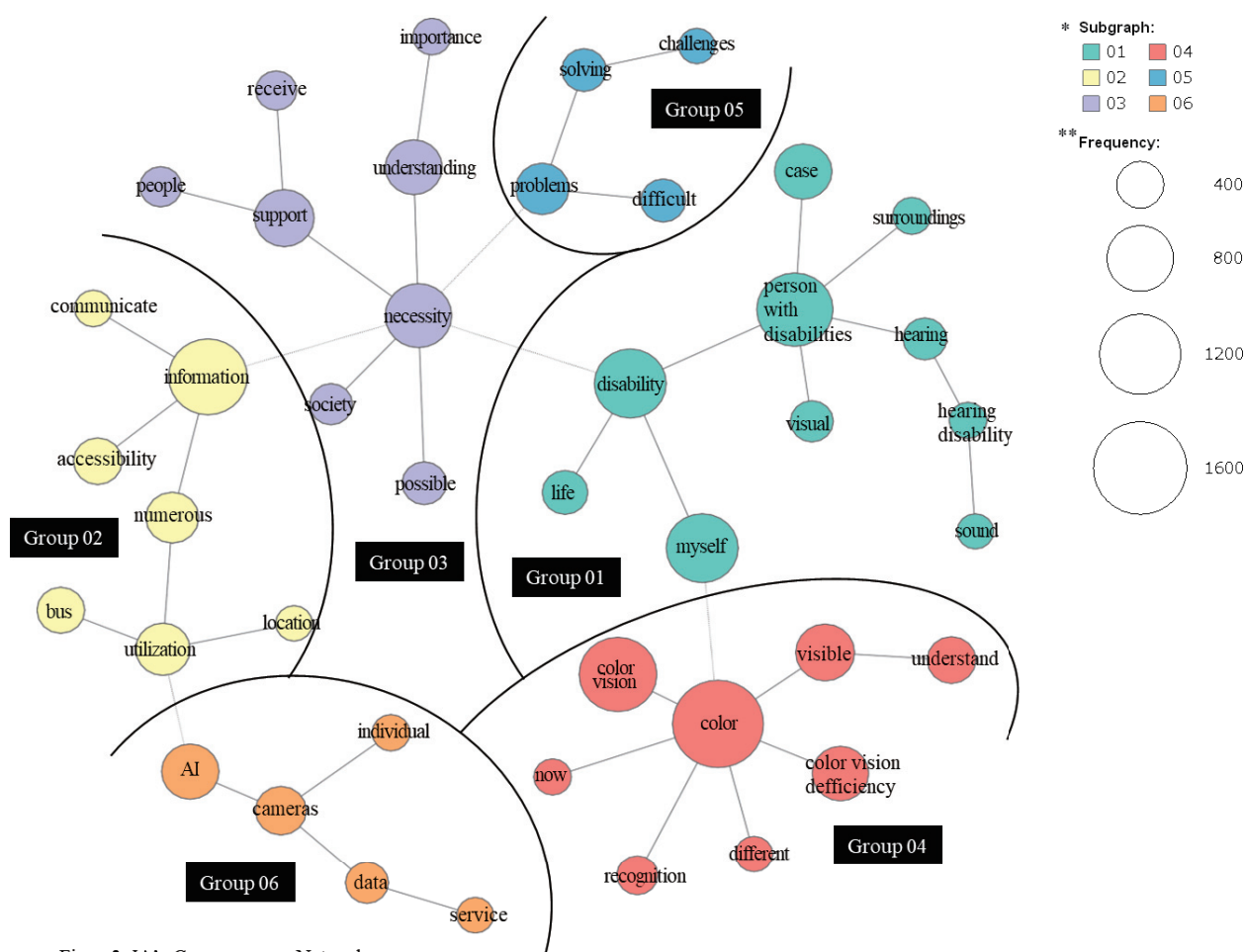


Figure3 IA's Co-occurrence Network

*Refers to a cluster formed by grouping words that exhibit strong co-occurrence relationships.

** Indicates the number of times each word appears in the text. Words with higher frequency are represented by larger nodes (circle).

Meanwhile, Group 05 mentioned the “problems” and “challenges” in achieving accessibility, such as “color vision tests being discontinued in elementary schools” and “how far AI and IoT should be applied in real society.” Furthermore, linking “necessity” to the “information” theme in Group 02, the necessity of improving information accessibility to “leave no one behind” was emphasized. Additionally, comments were made regarding the advantages and disadvantages of large volumes of information, such as in the following statements: “Information accessibility significantly increases the amount of information that can be received” and “while conveying as much information as possible is important, displaying too much information can become overly complex.” Problems with “bus” usage were also raised, such as “inadequate bus operation

systems for wheelchair users.” Furthermore, focusing on “AI” and “cameras,” Group 06 discussed concerns about balancing “data” collection with privacy issues to provide more effective data utilization services. They noted that this balance is extremely difficult to achieve. Additionally, focusing on “color” and “color vision,” Group 04 discussed differences in color perception, using terms like “color vision deficiency” and “color vision impairment” and mentioning how colors are perceived. Thus, participants gained insights into identifying challenges and solutions from perspectives such as vision, hearing, color vision, and data utilization with the aim of improving the accessibility of various types of information.

3.2. Comparison of Learning Between PS students and GSs:

Coding rules were created based on the content of each course’s subgraphs and specific examples of student comments. For IBFS, the following 19 themes were identified: From Group 04: “The old me and the current me,” “My relationship with disability,” and “Awareness from others”; from Group 02: “Need for support,” “Mention of informational barriers,” “Mention of institutional barriers,” “Mention of psychological barriers,”

Table 5. Comparison of Mention Counts Between PS students and GSs in IBFS

	The old me and the current me	My relationship with disability	Awareness from others	Need for support	Mention of informational barriers	Mention of institutional barriers
PS	0 (0.00%)	6 (3.31%)	24 (13.26%)	23 (12.71%)	19 (10.50%)	5 (2.76%)
GSs	6 (0.61%)	44 (4.49%)	129 (13.18%)	100 (10.21%)	81 (8.27%)	20 (2.04%)
Total	6 (0.52%)	50 (4.31%)	153 (13.19%)	123 (10.60%)	100 (8.62%)	25 (2.16%)
Chi-squared value	0.242	0.269	0.000	0.756	0.697	0.111
	Mention of psychological barriers	Mention of physical barriers	Mention of social barriers	Anxiety about COVID-19 infection	Learning barriers during the pandemic	Time constraints
PS	3 (1.66%)	2 (1.10%)	24 (13.26%)	11 (6.08%)	11 (6.08%)	22 (12.15%)
GSs	14 (1.43%)	8 (0.82%)	76 (7.76%)	67 (6.84%)	74 (7.56%)	80 (8.17%)
Total	17 (1.47%)	10 (0.86%)	100 (8.62%)	78 (6.72%)	85 (7.33%)	102 (8.79%)
Chi-squared value	0.000	0.000	5.182*	0.047	0.300	2.546
	Barriers for wheelchair users/ individuals with Physical disabilities	The ‘seeing’ of individuals with Visual disabilities	Conversation/ speaking with individuals with Hearing disabilities	Negative perceptions of Psychosocial disabilities/Mental illnesses	Awareness of perceptions regarding Psychosocial disabilities/Mental illnesses	The influence of words
PS	29 (16.02%)	13 (7.18%)	18 (9.94%)	20 (11.05%)	9 (4.97%)	1 (0.55%)
GSs	157 (16.04%)	70 (7.15%)	91 (9.30%)	130 (13.28%)	60 (6.13%)	5 (0.51%)
Total	186 (16.03%)	83 (7.16%)	109 (9.40%)	150 (12.93%)	69 (5.95%)	6 (0.52%)
Chi-squared value	0.000	0.000	0.019	0.491	0.188	0.000
	References to suicide rates	Number of cases				
PS	14 (7.73%)	181				
GSs	88 (8.99%)	979				
Total	102 (8.79%)	1160				
Chi-squared value	0.164					

*, indicates a significance level of 5%.

“Mention of physical barriers,” and “Mention of social barriers”; from Group 01: “Anxiety about COVID-19 infection,” “Learning barriers during the pandemic,” and “Time constraints”; from Group 06: “Barriers for wheelchair users / individuals with physical disabilities”; from Group 03: “The ‘seeing’ of individuals with visual disabilities,” “Conversation/speaking with individuals with Hearing disabilities”; and from Group 05: “Negative perceptions of Psychosocial disabilities/Mental illnesses,” “Awareness of perceptions regarding Psychosocial disabilities/Mental illnesses,” “The influence of words,” and “References to suicide rates.” A chi-square test that compared the number of references between PS students and GSs revealed a significant association only for “Mention of social barriers” ($\chi^2 = 5.182$, $df = 1$, $p < .05$), which indicated that PS students mentioned this concept more frequently than GSs. (Table 5).

Table 6. Comparison of Mention Counts Between PS students and GSs in UDR

	The necessity and importance of achieving UD	UD in daily life	The need for environmental design	The need for understanding	Facilities for wheelchair users	Handwashing facilities designed for diverse users
PS	11 (2.68%)	17 (4.14%)	21 (5.11%)	4 (0.97%)	12 (2.92%)	20 (4.87%)
GSs	210 (3.61%)	189 (3.25%)	176 (3.03%)	115 (1.98%)	98 (1.68%)	157 (2.70%)
Total	221 (3.55%)	206 (3.31%)	197 (3.16%)	119 (1.91%)	110 (1.77%)	177 (2.84%)
Chi-squared value	0.724	0.688	4.783*	1.563	2.700	5.768*

	Installation of tactile paving	Meeting minority needs	Societal challenges and difficulties in problem solving	Barrier-free design in urban and architectural fields	The old me and the current me	Having a disability
PS	12 (2.92%)	4 (0.97%)	10 (2.43%)	13 (3.16%)	0 (0.00%)	21 (5.11%)
GSs	151 (2.60%)	118 (2.03%)	144 (2.48%)	230 (3.95%)	11 (0.19%)	549 (9.44%)
Total	163 (2.62%)	122 (1.96%)	154 (2.47%)	243 (3.90%)	11 (0.18%)	570 (9.15%)
Chi-squared value	0.056	1.710	0.000	0.447	0.075	8.137**

	Persons with disabilities and ‘Able-bodied persons’	Support for students	Support in school education	Students with disabilities	UD in laws and systems	Number of cases
PS	16 (3.89%)	2 (0.49%)	7 (1.70%)	3 (0.73%)	12 (2.92%)	411
GSs	229 (3.94%)	56 (0.96%)	125 (2.15%)	77 (1.32%)	272 (4.68%)	5817
Total	245 (3.93%)	58 (0.93%)	132 (2.12%)	80 (1.28%)	284 (4.56%)	6228
Chi-squared value	0.000	0.498	0.184	0.650	2.332	

*, indicates a significance level of 5%. **, indicates a significance level of 1%.

Next, for the UDR course, the following 18 themes were identified: From Group 01: “The necessity and importance of achieving UD,” “UD in daily life,” “The need for environmental design,” and “The need for understanding”; from Group 04: “Facilities for wheelchair users,” “Handwashing facilities designed for diverse users,” and “Installation of tactile paving”; from Group 05: “Meeting minority needs”; from Group 08: “Societal challenges and difficulties in problem solving”; from Group 06: “Barrier-free design in urban and architectural fields”; from Group 02: “The old me and the current me,” “Having a disability,” “Persons with

disabilities and ‘Able-bodied persons’”; from Group 03: “Support for students” and “Support in school education”; from Group 07: “Students with disabilities”; from Group 09: “UD in laws and systems”; from Group 10: “Visual disabilities and invisible differences in perception.” Similarly, when the number of mentions was compared using a chi-square test, PS students were found to significantly mention “the need for environmental design” and “handwashing facilities designed for diverse users” more frequently than GSs ($\chi^2 = 4.783, df = 1, p < .05$; $\chi^2 = 5.768, df = 1, p < .05$), while “having a disability” was significantly more frequently mentioned by GSs than by PS students ($\chi^2 = 8.137, df = 1, p < .01$). No mention was found of “visually disabilities and invisible differences in perception.” (Table 6).

Lastly, for the IA course, the following 14 themes were identified: From Group 01: “References to people with visual disabilities,” “References to people with hearing disabilities,” “Relationships between people with disabilities and those around them,” and “My relationship with disability”; from Group 03: “Need for support” and “The necessity and importance of understanding”; from Group 05: “The difficulty of solving problems and challenges”; from Group 02: “Improving information accessibility and the necessity of information assurance,” “Advantages and disadvantages of information overload,” and “Issues with bus usage”; from

Table 7. Comparison of Mention Counts Between PS students and GSs in IA

	References to person with visual disabilities	References to person with hearing disabilities	Relationships between people with disabilities and those around them	My relationship with disability	Need for support	The necessity and importance of understanding
PS	41 (9.69%)	37 (8.75%)	9 (2.13%)	5 (1.18%)	12 (2.84%)	12 (2.84%)
GSs	262 (11.87%)	269 (12.19%)	82 (3.72%)	31 (1.40%)	23 (1.04%)	51 (2.31%)
Total	303 (11.52%)	306 (11.63%)	91 (3.46%)	36 (1.37%)	35 (1.33%)	63 (2.40%)
Chi-squared value	1.446	3.761	2.225	0.018	7.394**	0.225
	The difficulty of solving problems and challenges	Improving information accessibility and the necessity of information assurance	Advantages and disadvantages of information overload	Issues with bus usage	Concerns about data services like AI cameras and personal information protection	Differences in color perception
PS	11 (2.60%)	8 (1.89%)	7 (1.65%)	3 (0.71%)	10 (2.36%)	6 (1.42%)
GSs	42 (1.90%)	43 (1.95%)	31 (1.40%)	45 (2.04%)	45 (2.04%)	47 (2.13%)
Total	53 (2.02%)	51 (1.94%)	38 (1.44%)	48 (1.83%)	55 (2.09%)	53 (2.02%)
Chi-squared value	0.557	0.000	0.030	2.800	0.059	0.585
	Color vision Deficiency and color vision impairment	Color vision	Number of cases			
PS	43 (10.17%)	24 (5.67%)	423			
GSs	274 (12.42%)	158 (7.16%)	2207			
Total	317 (12.05%)	182 (6.92%)	2630			
Chi-squared value	1.489	0.996				

**, indicates a significance level of 1%.

Group 06: “Concerns about data services like AI cameras and personal information protection”; and from Group 04: “Differences in color perception,” “Color vision deficiency and color vision impairment,” and “Color vision.” The analysis results revealed that PS students accounted for a significantly higher proportion than GSs regarding the “Need for support.” ($\chi^2 = 7.394$, $df = 1$, $p < .01$) (Table 7).

4. Discussion

This study examined student reports from three accessibility-related courses (IBFS, UDR, and IA) at Kyushu University to investigate the characteristics of learning in each course as well as the differences in learning between PS students and GSs. The discussions in the following subsections are based on the results of these analyses.

4.1. Relationship Between Learning in Each Subject and DEI:

The co-occurrence network results revealed that all three courses, while aligning with the principles of DEI education, are structured to promote learning in different aspects.

First, in the IBFS course, numerous descriptions were found concerning the perspectives for understanding people’s diverse existence, such as the recognition of different types of disabilities and everyday barriers. These were considered to function as opportunities for self-reflection, grounded in an understanding of diversity. Even within the same disability type, understanding of individual differences was encouraged in how symptoms or characteristics manifest. This was seen in descriptions like “the way people with low vision see varies from person to person.”

Next, in the UDR course, many terms appeared that alluded to inclusive environmental development focused on society as a whole, such as creating inclusive environments and designs that can be used by everyone. References were also conscious of inclusive systems at the societal level, such as laws and institutions, urban and architectural design, and school education, which suggests a deepening recognition of inclusion. Conversely, as seen in statements like “I can’t find an answer for myself right now,” the difficulties and conflicts involved in driving change were also documented. Such uncertainty among students, manifesting as a sense of incompleteness, fosters the continuity of inquiry and can be viewed as an educationally significant opportunity.

Lastly, in the IA course, the learning centered on ensuring equitable access to information, focusing primarily on assistive technologies in students’ more familiar daily lives. This indicates that an understanding of equity was gained. Alongside the accumulation of knowledge on accessibility and technological advancements, ethical issues such as the handling of personal information were also highlighted. These can be considered challenges to examine in the future to ensure equity in society.

In summary, the above findings suggest that students acquired the fundamental principles of DEI education across the three courses, indicating the effectiveness of the curriculum design for accessibility-related courses. The principles of DEI are complementary, as understanding diversity is not an end in itself; rather, when it is linked with equity and inclusion, it enables deeper learning and shared perspectives.^{17, 18} Walton (2025) noted that diversity without equity becomes hollow, and that equity without inclusion risks excluding diverse

voices.¹⁹ Thus, it is crucial to understand all three principles of DEI, as opposed to just understanding one. Consequently, learning across the three courses suggests the potential to foster an integrated understanding of DEI and to cultivate individuals who are capable of contributing to social innovation.

Furthermore, students on all three courses gained the perspective of re-examining disability in relation to themselves. In IBFS and IA, students who previously viewed disability as unrelated to themselves demonstrated shifts in awareness, such as an increased motivation to become supporters. Moreover, in terms of “The influence of words” (IBFS), students recognized that their own words might have created barriers. In “The old me and the current me” (UDR), students reflected on their past words and actions, acknowledging how they had interacted with people with disabilities based on their own values. They recognized the possibility that their own words and actions might have created social barriers for others. As mentioned at the outset, social barriers include those that exist in the mind, such as individual consciousness and attitudes. While research has noted that acquiring knowledge increases students’ interest in disability and motivation to support,⁶ the recognition of the barriers inherent in students’ own consciousness and attitudes can also be considered a step toward the removal of social barriers. Therefore, education grounded in the social model⁴ should not merely cultivate in students the perspective of being a supporter. Rather, it is crucial to foster students becoming aware of the meanings embedded in their own consciousness, attitudes, and values and understanding social barriers in relation to themselves.

4.2. Differences in Learning Between PS Students and GSs

The chi-squared test revealed partial differences between PS students and GSs. First, in the IBFS course, PS students mentioned social barriers significantly more frequently, which may stem from these students’ internalized awareness based on the social model. The fundamental principle of PS activities is the removal or reduction of social barriers. Accordingly, PS activities provide substantial opportunities for participants to learn about the social model, which constitutes a core underlying principle, through study sessions and training programs. Engagement in PS activities grounded in these principles may also account for the frequent references to the social model observed in this study, a relationship that warrants further examination.

Next, in the UDR course, PS students frequently mentioned the “need for environmental design” and “handwashing facilities designed for diverse users.” This may be influenced by the social imagination cultivated through practical activities like creating barrier-free maps and providing mobility support. Conversely, the expression “having a disability” was found to be more common among GSs. Here, the distinction between “impairment” and “disability” is relevant,⁴ as are the differences in the background behind writing “disability” as “障がい” or “障碍” in Japanese;^{20, 21} furthermore, the differences in meaning between expressions like “disabled person” and “person with a disability” continue to be debated.²⁰ From the perspective of the social model, while no clear conclusion exists on which expression is more appropriate, since disability arises in relation to society, expressing it as “with disability” using “disability” is natural. Conversely, the expression “having a disability” is often considered a personal model-based expression that reflects the concept of “impairment” as something that resides within the individual. While this study was unable to definitively determine students’ intentions behind these expressions, the approach of selecting words

based on the meaning embedded within the expressions is considered an important perspective that reflects how disability is perceived.

Finally, in the IA course, PS students frequently mentioned the “need for support.” This suggests that PS students, who take on the role of supporters, tend to perceive support practices more personally. In particular, PS students who had been engaged in PS activities for an extended period may have cultivated more extensive knowledge and skills through their support activities, thereby further strengthening their sense of role as supporters. Takahashi et al. (2020) noted that while students’ interest increases through knowledge-based lectures, their understanding remains limited without actual engagement experience.⁶ Therefore, mechanisms that combine experiential understanding with knowledge-based understanding are required.

In summary, the findings of this study suggest that PS students internalize their understanding of the social model not merely as knowledge but also through practice. This difference likely indicates that PS activities function not merely as support activities but also as opportunities for deepening their understanding of others as well as their awareness of coexistence within the context of one’s own self.

4.3. Summary and Future Challenges:

This study suggests that, within Kyushu University’s accessibility-related courses, students are able to cultivate DEI competencies. Specifically, learning these concepts in an interdisciplinary manner will contribute to developing individuals who are equipped with an accessibility mindset aimed at removing social barriers. Furthermore, among PS students, the internalization of the social model is promoted through PS activities, which suggests the significance of experiential learning. Moving forward, developing education that involves experiential understanding among GSs is expected to foster PS students’ further awareness of them being contributors to a coexistence society.

This study has several limitations. First, while it used text mining to comprehensively grasp learning across subjects, this technique entailed limitations in terms of interpreting context-dependent meaning. For example, as seen in the UDR course, challenges arose in terms of fully discerning students’ intent embedded in expressions like “having a disability.” When addressing the understanding of the social model, understanding the meaning embedded within words is crucial. Therefore, future research should employ individualized scrutiny of the meaning within report assignments and conduct detailed examinations of student narratives through interviews. Supplementing the findings with such qualitative data will likely enable a deeper grasp of the process through which students understand and internalize the social model to be obtained. Second, this study lacked control over students’ learning histories and practical experiences outside PS activities. Although learning outcomes were compared between PS students and GSs, the PS student group itself comprised individuals with diverse educational and practical backgrounds. For example, some students had completed all three courses, while others had not; similarly, levels of participation in PS support activities varied considerably. Among GSs as well, some may have encountered DEI-related concepts through other contexts, such as club activities or volunteer work, despite not being directly involved in PS activities. In light of these factors, differences observed between PS students and GSs in this study should be interpreted with caution. Future research that more carefully examines prior learning experiences beyond these courses, as well as practical

experiences outside PS activities, may enable a more precise identification of the factors influencing student learning related to DEI.

Addendum

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