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Analysis of the Benefits of Deaf Faculty Classes for University Students and the Costs of Accommodation of Deaf Faculty Members: An International Comparison

Analyse des avantages des cours donnés par des professeur·es sourd·es pour les étudiant·es universitaires et les frais associés à l'accommodement des professeur·es sourd·es : Une comparaison internationale

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Abstract

While many universities have developed disability services and research projects for disabled students, only a handful have extended such services and initiatives to disabled faculty members. This study aimed to identify university students' evaluation of the benefits of deaf faculty classes. The study adopted an explanatory and exploratory sequential mixed-methods design, and participants included students who attended classes taught by the deaf and hard-of-hearing (D/HH) faculty members employed at mainstream universities. A total of 104 students in D/HH faculty classes at universities in Japan, the United States, Canada, Ghana, and Sweden participated in the surveys, and 19 students participated in the interviews. This study also interviewed 25 D/HH faculty members from universities in Japan, the United States, Canada, the United Kingdom, Ireland, Norway, Sweden, Germany, the Netherlands, and Ghana. Fifty-seven D/HH faculty members from these countries as well as Australia, Finland, South Africa, and Belgium, participated in the surveys. The study analyzed students' willingness to pay for classes taught by D/HH faculty members, and found that students' total values were higher than the labor and accommodation costs of D/HH faculty members. As the evaluation included participants from various countries, the study also observed that the financial support system for accommodating D/HH faculty members in higher education varied among countries. This study demonstrated that students had higher expectations, especially regarding the development of disability services for faculty members with disabilities. The study also advocates recognizing the importance of expanding financial resources, establishing disability services, and training sign language interpreters.

Résumé

De nombreuses universités ont mis en place des services et des projets de recherche destinés aux étudiant·es handicapé·es. Cependant, seulement quelques-unes ont étendu ces services et initiatives aux membres handicapés du corps professoral. Cette étude visait à connaitre l'évaluation par les étudiant·es universitaires des avantages des cours donnés par des professeur·es sourd·es. D'une conception à méthodes mixtes séquentielles explicatives et exploratoires, les participant·es à cette étude étaient des étudiant·es qui ont suivi des cours dispensés par des membres du corps professoral sourds ou malentendants au sein d'universités généralistes. Au total, 104 étudiant·es de cours donnés par des membres du corps professoral sourds ou malentendants employés dans des universités au Japon, aux États-Unis, au Canada, au

Ghana et en Suède ont participé aux sondages et 19 étudiant·es ont participé aux entrevues. Cette étude a également passé en entrevue 25 membres du corps professoral sourds ou malentendants employés dans des universités au Japon, aux États-Unis, au Canada, au Royaume-Uni, en Irlande, en Norvège, en Suède, en Allemagne, aux Pays-Bas et au Ghana. Cinquante-sept membres du corps professoral sourds ou malentendants de ces pays ainsi que d'Australie, de Finlande, d'Afrique du Sud et de Belgique ont participé aux sondages. L'étude a analysé la volonté des étudiant·es de payer pour les cours dispensés par les membres du corps professoral sourds ou malentendants et a constaté que les valeurs totales des étudiant·es étaient supérieures aux couts de main-d'œuvre et d'accommodement des membres du corps professoral sourds ou malentendants. Comme l'évaluation comprenait des participant·es de divers pays, l'étude a également observé que l'offre de soutien financier pour accommoder les membres du corps professoral sourds ou malentendants aux cycles supérieurs variait d'un pays à l'autre. Cette étude a démontré que les étudiant·es avaient des attentes plus élevées, notamment en ce qui concerne le développement de services aux personnes handicapées pour les professeur·es handicapé·es. L'étude préconise également la reconnaissance de l'importance d'accroitre les ressources financières, d'établir des services pour les personnes handicapées et de former des interprètes en langue des signes.

Keywords
Accessibility; Cost Effectiveness; Disability Services; Deaf and Hard-of-Hearing Faculty Members; University Students; Mixed Methods Research; International Comparison; University Administration

Introduction

The advancement of disability rights laws has encouraged universities to expand disability services and research projects for students with disabilities. Previous studies have discussed the challenges of accommodation and faculty attitudes toward disabled students in Canada (Mullins & Preyde, 2013), the United States (Baker et al., 2012; Bruder & Mogro-Wilson, 2013; Gibson, 2012; Harpur & Loudoun, 2011), and Japan (Koike & Wakai, 2012; Tanaka & Nohara, 2007). Additional studies have explored guidelines for supporting disabled students in the United States (Kim, 2020) and Japan (Japan Student Services Organization, 2018; Suguoka et al., 2018).

However, only a few universities have developed disability services and research projects tailored to faculty members with disabilities (Smith & Andrews, 2015), and several studies have discussed the issues of accommodation for disabled faculties in Canada (Crooks et al., 2011; Saltes, 2020; Waterfield et al., 2017), the United States (Evans et al., 2017; Kerschbaum & Price, 2016; Kerschbaum & Price, 2017), the United Kingdom (Olsen et al., 2020), and Japan (Nakamura, 2020). Several studies have also provided guidelines for the mental health of faculty with disabilities in the United States (Kerschbaum et al., 2017; Price & Kerschbaum, 2017). In particular, some previous studies have scrutinized the issues of accommodation for deaf and hard-of-hearing (D/HH) faculty members in the United States (Burke & Nicodemus, 2012; Stapleton, 2015), Canada, Australia (Campbell et al., 2008; Woodcock et al., 2007), and the United Kingdom (Brien, 2019; Brien, 2020).

Furthermore, most studies investigating the challenges faced by disabled faculty focus on the lack of accommodation in higher education, and rarely discuss the contributions of disabled faculty or the benefits attained by university students who attended classes taught by disabled

faculty members. A comparison of cost-effectiveness with disability accommodation was not discussed in these studies. The existing research on this topic is limited.

Disability accommodation and cost per capita depend on the disability type. For example, wheelchair users would need ramps or automatic doors to access their offices, necessitating higher expenditure for disability accommodation. However, it requires only a one-time payment, and does not incur additional costs for ongoing disability accommodation. Blind faculty members need technical equipment, such as speech reader software, which calls for a higher expenditure but again requires only a one-time payment for ongoing disability accommodation.

D/HH faculty members use technology for communication access, such as messaging systems, speech-to-text software, and automatic captioning systems. Automatic captions still limit the reliability of translating technical language and meeting agendas because of translation errors. This makes it essential to hire a captionist or sign language interpreter to ensure accurate information, which incurs higher costs for disability accommodation in the workplace. As a result, some universities might be hesitant to hire D/HH faculty members, who might in turn feel reluctant to request accommodation until they secure a permanent position (Smith & Andrews, 2015; Stapleton, 2015). It is unknown whether a low D/HH faculty employment rate and lack of a support system were negatively associated with preventing D/HH faculty contributions. Additionally, it lacks a measurement of the "quantitative" values toward D/HH faculty contributions, which is essential for further studies.

Therefore, this study aimed to identify university students' evaluations of the benefits of classes taught by D/HH faculty members. On the premise that the study finds university students' total valuation of the benefits to be higher than the actual costs of deaf faculty accommodation, the study recommends that university administrators recognize deaf faculty

members' contributions and develop funding resources to improve the support system for deaf and disabled faculty.

II. Methodology

2.1. Research Questions

The study proposed three research questions:

1) What are the students' total values in deaf faculty classes? Are students' total values higher than the actual accommodation costs?
2) Are the D/HH faculty's contributions affected by the quality of accommodation?
3) What are the recommendations for improving support systems for D/HH faculty members?

2.2. Target Population

The study recruited two groups: (1) university students who attended classes taught by D/HH faculty members at universities, and (2) D/HH faculty members employed at mainstream universities. The student target group attended universities in Japan, the United States, Canada, Ghana, and Sweden, and the faculty target group studied and worked at universities in the aforementioned countries as well as in the United Kingdom, Ireland, Norway, Finland, Germany, the Netherlands, Belgium, Turkey, and South Africa. As the analysis involved international participants, the researcher used Japanese Sign Language, American Sign Language, British Sign Language, and International Sign, as well as Japanese and English, for the data collection. The researcher distributed online surveys and interview guides in both Japanese and English. The study conducted cognitive interviews from May 2021 to June 2021 and then collected quantitative and qualitative data from July 2021 to November 2021. After interview collection, the researcher asked the participants who opted to be interviewed to check their interview

transcripts for translation accuracy.

2.3. Explanatory Design Analysis of University Students

2.3.1. Contingent Valuation Method

The study adopted an explanatory sequential mixed methods design, which first collected quantitative data and then qualitative data (Creswell & Clark, 2011). Online surveys employed in this study used the payment card approach of the contingent valuation method (CVM), which is commonly used as a nonmarket valuation method for estimating the benefits of environmental goods and services (Mitchell & Carson, 1989). Historically, the CVM approach first examined resource creation and recreation planning in the US National Park Service (Ciriacy-Wantrup, 1952; Davis, 1963; Dofman, 1963). CVM became widely popular among policymakers in the1980s, which led to the Comprehensive Environmental Responses, Compensation and Labiality Act, and led *State of Ohio v. US Department of the Interior* (1989) to establish a new CVM policy (Venkatachalam, 2004). Carson et al. (2001) discussed the reliability and validity of the CVM approach.

The CVM asks a hypothetical question and measures the amount people would be willing to pay (WTP) for a public good (Mitchell & Carson, 1989). The CVM has different types of questions, and the payment card (PC) approach asks respondents to choose the value that represents their maximum WTP by presenting them with a list from the minimum to the maximum amount of money values (Mitchell & Carson, 1989). The study adopted the PC approach because of the following advantages:1) respondents can answer the WTP question without mental pressure compared to open-ended answers; 2) respondents' WTP can be determined directly from the original data; and 3) respondents' average WTP can be calculated by the averages of WTP for a small sample size (Ready et al., 2001, Mitchell & Carson, 1989;

Xu et al., 2011).

Conversely, CVM takes another widely used dichotomous choice (DC) approach (Bateman et al., 2002; Calia & Strazzera, 2010). In the DC approach, respondents were only required to answer YES or NO when asked if they were willing to pay a given amount (bid) for the public good. The DC approach has the advantage of minimizing the risk of strategic behavior that attempts to overestimate or underestimate the results of the analysis. However, the DC approach has the disadvantage of requiring a large sample size for statistical analyses (Bateman et al., 2002). Since this study had a small sample size and little strategic bias was expected to be, the DC approach was unsuitable for data analysis. Thus, this study adopted the PC approach, which was able to calculate the average WTP through a small sample size.

Regarding its acceptability among researchers, CVM has potential biases, such as part-whole bias, payment vehicle bias, and hypothetical bias (Terewaki, n.d.). However, international research studies have used the CVM approach to measure WTP for green food, quality-adjusted life, health gains, campus safety apps, emergency texting, captioned online courses, etc. (Soeteman et al., 2016; Tian et al., 2011; Ye et al., 2021; Yabe, 2015a; Yabe, 2015b; Yabe, 2016; Yabe, 2017). Furthermore, previous studies have not discussed how to monetize the value of D/HH faculty contributions in terms of equity and inclusion. Although previous studies have suggested increasing numbers of disabled faculty members and developing support systems, the responses to requests for an estimated budget and the exact number of disabled faculty members for employment are still unclear. Therefore, it is essential to evaluate the *quantitative* value of D/HH faculty contributions. This study pioneers a new step in adapting the CVM approach to determine the values of D/HH faculty contributions and clarify the funding amounts to develop appropriate support systems.

2.3.2 Contingent Valuation Survey and Statistical Analysis

The researcher asked university students (*n*=104) how much they would be willing to pay for deaf faculty classes compared to non-deaf faculty classes. This study estimated the total values of deaf faculty classes by multiplying the average WTP of university students and the total population of university students. The survey respondents included non-disabled students (*n*=80), deaf/disabled students (*n*=18), and other students with an unknown disability status (*n*=6).

Table 1 presents the CV survey questions. Respondents were asked to imagine that they would be willing to pay more to attend a class taught by a deaf faculty member than for a class taught by a non-deaf faculty member. Their willingness to pay reflects the estimated total value they place in the class taught by the deaf faculty member. How much would they be willing to pay to attend a class taught by a deaf faculty member? The answer options consisted of 16 choices: 0 = Would not be willing to pay ($0), 1 = up to $10, 2 = up to $20, …14 = up to $400, 15 = up to $500, other ($__).

The survey questionnaire included questions on university students' backgrounds, benefits, communication barriers, classroom experiences, and social attributes. The study conducted a statistical analysis (chi-square test, t-test, and multiple regression) to identify whether there was a correlation between university students' WTP and their social attributes.

Table 1: A Sample of Contingent Valuation Method Survey Questions

Q. Imagine that you would be willing to pay more to attend a class taught by a deaf faculty member than for a class taught by a non-deaf faculty member. Your willingness to pay would reflect the estimated total value you place on the class taught by the deaf faculty member. How much would you be willing to pay to attend a class taught by a deaf faculty member? The amount you would be willing to pay would come out of your daily expenses. • Up to $10 • Up to $20 • Up to $30

• Up to $40 • Up to $50 • Up to $60 • Up to $70 • Up to $80 • Up to $90 • Up to $100 • Up to $200 • Up to $300 • Up to $400 • Up to $500 • Other ($) • I would not be willing to pay ($0)
Note: Only one answer allowed. A link to access USD currency converter was included.

2.3.3 Qualitative Interview and Content Analysis

Online interviews were conducted with university students (*n*=19) who participated in the first phase (surveys) and offered cooperation during the second phase (interviews). Interview participants attended D/HH faculty classes at universities in Japan (*n*=5), the United States (*n*=7), Canada (*n*=2), Ghana (*n*=4), and Sweden (*n*=1). The interview participants were composed of D/HH (*n*=3) and hearing students (*n*=16).

The interview guide consisted of semi-structured interview questions, including the university students' socioeconomic and questions such as, "How did the deaf faculty's class benefit you?" "What communication barriers did you encounter in the deaf faculty class?" "As you answered the amount of $XXX in the previous survey, could you please explain why you would be willing to pay for a deaf faculty class compared to a non-deaf faculty class?" "Did the deaf faculty class influence your career goals?" "If you would like to take the deaf faculty class again, why? Or why not?" This study collected in-depth qualitative data to identify WTP reasons for attending deaf faculty classes.

The study used content analysis (Hsieh & Shannon, 2005) and divided the data into five

categories (student background, class background, CVM, benefits and experience, and suggestions). The researcher created a codebook with these categories and meticulously coded the interview transcripts. Another codebook was created for open-ended answers to the survey. The researcher divided the data into four categories (student background, class background, CVM, benefits, and experience), coded open-ended answers, and compared qualitative and quantitative codebooks.

2.4. Exploratory Design Analysis on Deaf and Hard-of-Hearing Faculty Members

2.4.1. Qualitative Interview and Content Analysis

The study adopted an exploratory sequential mixed-methods design, first collecting qualitative data and then collecting quantitative data for validation (Creswell & Clark, 2011). As previous studies did not have an example of a survey questionnaire about D/HH faculty contributions, we developed an interview guide and detailed how accommodation helped enrich D/HH faculty contributions. This study targeted 25 D/HH faculty members working in mainstream universities in Japan (*n*=5), the United States (*n*=6), Canada (*n*=1), the United Kingdom (*n*=7), Ireland (*n*=1), Sweden (*n*=1), Norway (*n*=1), the Netherlands (*n*=1), Germany (*n*=1), and Ghana (*n*=1).

To clarify, 15 D/HH faculty members had studied and worked at their former and alumni universities in different countries (e.g., Japan, the United States, Canada, the United Kingdom, Australia, Belgium, Finland, Turkey, and the Netherlands). Consequently, the study listed their country of origin based on their current workplace, but not their birthplace. As the research included international participants, the researcher used Japanese Sign Language, American Sign Language, British Sign Language, International Sign, and Japanese and English.

The interview guide asked questions about D/HH faculty members' experiences with

accommodation at current, former, and alumni universities; the differences between student and faculty accommodation; and their suggestions for improving the support systems for D/HH faculty members. The study adopted content analysis (Hsieh & Shannon, 2005) and divided the data into eight categories (faculty background, university background, current university, former university, alumni university, comparison, suggestion, and others). The researcher created a codebook and coded interview transcripts. The researcher also created a codebook and divided the data into eight categories, based on the survey's open-ended answers. The researcher then compared qualitative and quantitative codebooks.

2.4.2. Quantitative Survey and Descriptive Analysis

This study conducted quantitative surveys with D/HH faculty members to validate the qualitative findings, using a large sample size. The survey questionnaire asked about their experiences with accommodation at current, former, and alumni universities; the differences between student and faculty accommodation; and their suggestions for improving the support systems for D/HH faculty members. In addition, the survey questionnaire asked about deaf faculty members' social attributes. This study compared qualitative and quantitative data categories and validated D/HH faculty contributions through descriptive analysis.

2.5. International Comparison of University Students and Deaf Faculty Members

2.5.1. Cost-Effectiveness on Deaf Faculty Accommodation and Students' Total Values

This study compares qualitative and quantitative data by estimating D/HH faculty accommodation costs and university students' total values per country.

III. Results

3.1. University Students' Willingness to Pay for Deaf Faculty Classes

Tables 2 and 3 show that the maximum students' WTP was $500, and the minimum

students' WTP was $0. The study found: "Yes, I would be willing to pay" (*n*=68), "No, I would not be willing to pay" (*n*=17). Respondents who were unable to understand the CVM survey question and responded with "Other" and "I would not be willing to pay" were identified as "Protest Bids" (*n*=19) and excluded from the data analysis. The average WTP of the university students (*n*=85) was $103.28 per year.

Table 2: International Comparison of University Students' WTP

WTP	United States/Canada	Japan	Ghana	Total
$0	9	5	3	17
$10-$50	6	18	3	27
$51-$100	14	0	6	20
$101-$500	16	1	4	21
Total	45	24	16	85

Table 3: International Comparison of Chi-Squared Tests

	Value	df	Exact Sig. (two-sided)
Pearson's Chi-Square	34.127*a*	6	***
Likelihood Ratio	38.968	6	***
Linear-by-Linear Association	1.917	1	0.166
N of Valid Cases	85		

*** p <.001.
(a)Four cells (33%) have expected counts of less than 5.
The minimum expected count is 3.20.

3.1.1. Reasons for University Students' Willingness to Pay

The researcher asked students why they were willing to pay for the deaf faculty class. The researcher found the following results: "There is added value in a deaf faculty class compared to a non-deaf faculty class" (*n*=44), "I want to support deaf faculty members" (*n*=37), "I am interested in attending a class taught by a deaf faculty member" (*n*=35), "I do not have a specific reason, but I would be willing to pay" (*n*=9), and "Other" (*n*=13). When the survey's open-ended answers were coded, most students emphasized the unique values that they would

not be able to learn from non-deaf faculty members, such as learning about the deaf faculty members' actual experiences, learning to communicate in sign languages from a deaf faculty member directly, and exposure to Deaf culture and communities; more importantly, they cited the benefits such a class would add to their career goals and higher degrees. D/HH students (*n*=11) felt that the classes were beneficial because they could look up to D/HH faculty members as role models and gain direct access to communication.

Following this, the researcher asked the interview participants regarding the criteria of their WTP and received the following responses: "Comparison between a non-deaf faculty class that provided captioning services versus a deaf faculty class that provided direct communication access" (*n*=1, by a Japanese deaf student), "lecture fees" (*n*=1, by a Japanese hearing student), "tuition fees" (*n*=2, by American hearing students), "textbook fees" (*n*=1, by American hearing student), "deaf faculty's specialization and skills" (*n*=5, by American/Ghanian hearing students), "deaf faculty's real experience" (*n*=1, by a Japanese hearing student), "direct learning benefit without the use of a sign language interpreter" (*n*=2, by Canadian hearing students), and "deaf faculty's expertise rather than deafness" (*n*=1, by a Ghanian hearing student).

Students who stated they would not be willing to pay for a deaf faculty class were asked to describe their reasons: "There is no difference between a deaf faculty class and a non-deaf faculty class" (*n*=9), "I am not interested in supporting deaf faculty members" (*n*=1), "I am not interested in attending a class taught by a deaf faculty member" (*n*=2), "I do not have a specific reason" (*n*=4), and "Other" (*n*=6).

When the students who responded with $0 as their WTP were interviewed, they acknowledged that they would estimate their values based on the class context rather than the disability status, and the researcher received the following responses: "tuition fee was free" (*n*=1,

by a Sweden deaf student), "tuition was an additional fee" (n=1, by an American hearing student), "The course topic and context was more important than a faculty's disability status" (n=1, by a Japanese hearing student), "There was no difference between deaf faculty and non-deaf faculty classes" (n=1, by an American hearing student). However, the first and second responses were due to students' tuition exemption policies in different countries or their lack of understanding of the CVM survey. Thus, these responses were identified as "protest bids" of the CVM and were excluded from the data analysis. The rest of the responses indicated that respondents would not be willing to pay for a class based on faculty disability status, but would value the course topic and context.

3.1.2. International Comparison among American/Canadian, Japanese, and Ghanian Students' Willingness to Pay

As Tables 4, 5, and 6 show, the study also analyzed the differences in the WTP of students from the United States and Canada (n=45), Japan (n=24), and Ghana (n=16). The three country groups had different WTP values, $p < .001$ ($\chi^2 = 31.127$). The United States/Canada, and Ghana had no significant difference. By contrast, the US/Canada and Japan had a significant difference, $p < .001$ ($t = 3.875$). Ghana and Japan also had a significant difference, $p < .01$ ($t = -2.258$).

The study found that the average WTP of Japanese students was $30.83 USD per year, which was lower than that of American/Canadian students' WTP ($141.11) and Ghanaian students ($118.44).

The potential reason each country's WTP varied was the different tuition fee systems in Japan, the United States, Canada, and Ghana. Generally, tuition fees from the United States and Canada are five to ten times more expensive than Japanese tuition fees (ACTIV8, 2022),

indicating that American and Canadian students would be willing to pay more, while Japanese students would be willing to pay less. However, Ghana has lower tuition fees and salary rates than the United States, Canada, and Japan (Kiiky, 2022). Despite the latter, Ghanaian students reported being willing to pay more than Japanese students did. Thus, the study needed to examine other factors influencing the WTP of students from each country as an implication of the variations.

Table 4: Comparison between American/Canadian Students' and Ghanian Students' WTP

	United States/Canada (*n* = 45)		**Ghana (*n* = 16)**		
	M	*SD*	*M*	*SD*	*t*
WTP	141.11	157.829	118.43	144.311	0.526

Table 5: Comparison between American/Canadian Students' and Japanese Students' WTP

	United States/Canada (*n* = 45)		**Japan (*n* = 24)**		
	M	*SD*	*M*	*SD*	*t*
WTP	141.11	157.829	30.83	69.948	4.007***

*** $p < .001$.

Table 6: Comparison between American/Canadian Students' and Japanese Students' WTP

	Ghana (*n* = 16)		**Japan (*n* = 24)**		
	M	*SD*	*M*	*SD*	*t*
WTP	118.43	144.311	30.83	69.948	–2.258 **

** $p < .01$.

3.2. The Status Quo of the Deaf and Hard-of-Hearing Faculty Members

3.2.1. The Support Systems at Current and Former Universities

The study found differences in D/HH faculty accommodation at current, former, and alumni universities: "I received both student accommodation and faculty accommodation" (*n*=35); "I received student accommodation, but I did not receive faculty accommodation" (*n*=7). "I received faculty accommodation, but I did not receive student accommodation" (*n*=13). "I received neither student accommodation nor faculty accommodation" (*n*=2).

The researcher asked D/HH faculty members (*n*=57) about their accommodation at their university. The researcher found that D/HH faculty members (*n*=53) received accommodation, and D/HH faculty members (*n*=4) did not. The types of accommodation were as follows: sign language interpreting services (*n*=44), captioning services (*n*=20), visual aids (*n*=23), FM systems (*n*=2), others (*n*=8), and 11 D/HH faculty members used speech reading. We also asked about accommodation for D/HH faculty members who had worked at their former universities (*n*=38). We found that D/HH faculty members (*n*=32) received accommodation, whereas D/HH faculty members (*n*=6) did not. The types of accommodation were as follows: sign language interpreting services (*n*=25), captioning services (*n*=12), visual aids (*n*=10), FM systems (*n*=2), and others (*n*=5); five D/HH faculty members used speech reading.

3.2.2. The Support Systems at Alumni Universities

Furthermore, the researcher asked about D/HH faculty members' accommodation at their alumni universities (*n*=49) and found that D/HH faculty members received accommodation (*n*=39), while D/HH faculty members did not (*n*=10). The researcher also interviewed 25 D/HH faculty members, some of whom did not receive accommodation. When a few deaf faculty members were students, they went to a university in the United States that is a full-sign language environment, and accommodation requests were unnecessary. In addition, when several D/HH faculty members were students at their respective universities, they had to conduct self-study and borrow notes from their classmates. However, they began to request accommodation when they obtained their master's and PhD degrees. Several D/HH faculty members learned sign language and requested sign language interpreters from their graduate schools. Therefore, the survey responses could not identify the difference in accommodation for bachelor's, master's, and PhD degrees, which helped cover the interview responses.

Most D/HH faculty members studied abroad. Interestingly, one international PhD student did not receive accommodation in Germany, as it would have been necessary to pay for sign language interpreting services out of pocket. Instead, the student worked as a researcher, and requested accommodation. Another international PhD student did not receive accommodation in their home country, but the student received accommodation in the United States. Owing to a native language policy, the Finnish government was unable to provide an International Sign interpreter for an international PhD student who used International Sign; however, the faculty advisor was fluent in International Sign. Other international PhD students did not require accommodation because their programs in the United Kingdom were Deaf studies, and sign language existed in full-sign language environments.

3.2.3 Definitions of Accommodation

The interview results helped obtain in-depth findings from the survey results. For example, D/HH faculty members responded that they had accommodation at current and previous universities. However, it is unknown whether the accommodation was official, paid by professional services, unpaid volunteers, or paid volunteers. For example, one faculty used "type-chat" for accommodation, which included their colleagues' transcribing but not professional captioning services. The other faculty members also used their faculty's notetaking for faculty meetings, but hired a professional notetaker for important meetings. One deaf faculty member who worked at a research center stated, "The center was Spoken-English only, and they provided English-German translation or German Sign Language, but not British Sign Language or International Sign. The International Sign interpreter was of poor quality. So, I requested students' captioning services in English."

Similar to student accommodation, one hard-of-hearing faculty member did not receive

accommodation as hearing loss developed and a disability statement was lacking. The other hard-of-hearing faculty members concealed the deafness and did not request accommodation. Even if accommodation is received, it is of poor quality. For example, four deaf faculty members who used FM systems brought their FM equipment and asked their professors to wear their microphones. However, they found it difficult to capture information from the group discussions. The FM system and hearing dogs belonged to the members and were not accommodated by universities.

A deaf faculty member from Japan used one classmate as a volunteer interpreter in the classroom. Only a few D/HH faculty members received official student accommodation through student disability services such as professional sign language interpreters, professional captioning services, and notetaking services. Some D/HH faculty members acquiring their bachelor's degrees did not provide accommodation, but requested or negotiated accommodation during their master's and PhD degrees, as in-depth specializations demand accommodation.

Therefore, the university systems for student and faculty accommodation differ by country. Universities in Japan, the United States, and Australia are financially responsible for accommodation, whereas governments are financially responsible for accommodation in countries such as Ghana, the United Kingdom, and northwestern Europe. Additionally, the United Kingdom and northwestern European governments only pay for native language interpreters (e.g., the Belgian government pays for Flemish Sign Language interpreters, but not for International Sign interpreters). Thus, D/HH faculty members from Japan and the United States emphasize increasing funding resources for accommodation, whereas those in the United Kingdom and northwestern Europe focus on the quality of academic sign language interpreters and funding resources for International Sign interpreters.

IV. Discussion

4.1. The Potential Contributions to Students' Willingness to Pay and Deaf Faculty Accommodation Costs

To address the first research question, "What are the students' total values in deaf faculty classes?" and "Are the students' total values higher than the actual accommodation costs?," the researcher first estimated American students' WTP for deaf faculty classes by multiplying the average of American and Canadian students ($141.11) and the average of public/in-state university tuitions in the United States ($10,338 in 2021–2022) (Powell et al., 2021). The researcher calculated the public/in-state university tuition fees for American/Canadian respondents (n=44) studying at public (n=43) and private universities (n=1). The average value of American and Canadian students' WTP was estimated to be 1.36% (= $141.11 / $10,338 × 100). The total student population was 19.4 million in 2020 (National Center for Education Statistics, 2022). Thus, the students' total values in deaf faculty classes were estimated to be approximately $2,727 million (= ($10,338 × 19,400,000 students × 1.36) /100).

The average salary of all university instructors and professors in 2020–2021 was $103,803 (Bryant, 2022). If a deaf faculty member teaches a 90-minute lecture per week for 16 weeks, they require two sign language interpreters and a 30-minute pre-meeting.

The total number of hours for sign language interpreters was estimated to be 640 (= two hours/lecture × five times per week × 16 weeks × two semesters × two interpreters). The costs incurred by sign language interpreters vary. The average salary was $28.17 per hour (Indeed, 2022). Thus, the total costs of sign language interpreters are an estimated $18,028.80 (= 640 hours × $28.17 per hour). Third, the total of deaf faculty labor/accommodation costs are estimated at $121,832 per person/year (= $103,803 salary average + $18,028.80 interpreter

costs).

By calculating the students' total WTP value on deaf faculty classes and the deaf faculty labor and accommodation costs (= $2,727,577,920 total values / $121,832 labor/accommodation costs), colleges/universities could hire 22,388 deaf faculty members in the United States. The United States has approximately 6,000 colleges and universities (Bryant, 2021), which means that 3.78 faculty members per college and university can be hired (22,388 deaf faculty / 6,000 colleges).

4.2. Issues regarding Academic Sign Language Interpreters

In response to the second research question, "Are the D/HH faculty's contributions affected by the quality of accommodation?" Even though the study was able to identify the students' total valuation toward deaf faculty classes, we found another factor affecting the quality of academic sign language interpreters. Each country has different requirements for sign language interpreters and often lacks academic sign language interpreters.

Each country has a different cost to a sign language interpretation. For example, one deaf faculty member mentioned that interpreting costs in Turkey were cheaper than those in Germany. A deaf faculty member from Norway pointed out that most interpreters were female and had at least a bachelor's degree. Due to lower salaries, there was a lack of academic sign language interpreters. Another deaf faculty member from Japan mentioned that one sign language interpreter company was too expensive, even if personnel were highly trained, so the faculty used their own staff as interpreters. Owing to lower salaries, many interpreters worked part-time jobs in Japan, Sweden, and other countries compared to those in the United States and the United Kingdom, where they had higher salaries sufficient to cover their living expenses and worked full time.

As D/HH faculty members are promoted, they encounter more challenges in finding academic interpreters at their level. Most interpreters hold at least bachelor's degrees, but very few hold master's degrees or PhD degrees or specialize in mental health, engineering, and so on. Thus, it is essential to advance interpreting education, which is a common issue in all countries. Therefore, D/HH faculty members negotiated not only for classrooms but also for conference participation, meeting participation, etc. Even if a deaf faculty member can secure an interpreter, this becomes meaningless if the quality of the interpretation is poor. Thus, the quality of accommodation affects the contributions of D/HH faculty members.

4.3. Recommendations for Improving the Support Systems for Deaf and Hard-of-Hearing Faculty

Addressing the third research question, "What is the recommendation for improving support systems for D/HH faculty members?" Table 7 illustrates that the suggestions of the students and D/HH faculty members shared common themes: demands regarding D/HH faculty numbers, improvement of support for D/HH faculty, and improvement and demand for academic sign language interpreters; their subthemes varied.

Both student and faculty respondents shared suggestions such as increasing the number of deaf faculty members, improving university accommodation, increasing the number of academic sign language interpreters, and improving their quality. Specifically, one deaf student from Sweden and one hearing student from Canada emphasized the training needs for Deaf certified interpreters, as they were studying in interpreting programs.

In contrast, the D/HH faculty provided more specific suggestions, such as establishing a professional network with D/HH faculty members worldwide, where they could exchange information and mentors on how to survive in academia and negotiate accommodation with

university administrations and governments. D/HH faculty also discussed the importance of academic sign language interpreters, such as the need for interpreter coordinators and funding resources for International Sign interpreters.

Moreover, our research revealed that in some instances, even if the departments in which D/HH faculty members work have Deaf awareness and open attitudes outside their departments, there is a lack of Deaf awareness in attitudes toward D/HH faculty members. For example, several D/HH faculty members mentioned that if they wanted to participate in an event outside their department, the other departments would not provide accommodation for the event, even if they worked at the same university.

More importantly, a few D/HH faculty members mentioned that hearing faculty members have the privilege of accessing more information about their universities by chatting with their colleagues in the hall, thus allowing them to learn more about university culture. Therefore, D/HH faculty members must take assertive action.

Table 7: Comparison between University Students' (*n* = 19) and Deaf and Hard-of-Hearing Faculty Member's (*n* = 25) Suggestions

University Students	***n***	**Deaf and Hard-of-Hearing Faculty Members**	***n***
Demands Regarding D/HH Faculty Members	*7*	*Demands Regarding D/HH Faculty Numbers and Network*	*10*
Diversity in D/HH Faculty Members	2	Demand among D/HH PhD Students	1
Demand of D/HH Faculty	4	Demand D/HH Faculty Mentoring	2
Support for Young D/HH Adults	1	Demand for D/HH Role Models	3
		Demand for D/HH Faculty Members	4
		Demand for D/HH Academic Network	5
Improvement of Support System for D/HH Faculty	*6*	*Improvement of Support System of D/HH Faculty*	*17*
University Support System	4	Development of Support System	6

University Students	***n***	**Deaf and Hard-of-Hearing Faculty Members**	***n***
Negotiation and Strategy	1	Obtain Funding Resources	6
Knowledge and Awareness	1	Improvement of Attitudes, Awareness, and Knowledge	*7*
		D/HH Faculty's Assertive Actions	2
Improvement and Demand on Academic Sign Language Interpreters	*2*	*Improvement and Demand on Academic Sign Language Interpreters*	*8*
Demand for Deaf Certified Interpreters	2	Improvement of Coordinating Sign Language Interpreters	3
		Demand for Academic Sign Language Interpreter Numbers	3
		Improvement of the Quality of Academic Interpreters	2
		Demand for International Sign Interpreters	1

4.4. Conclusion

This study adopted an explanatory sequential mixed methods design to measure university students' willingness to pay as well as the actual costs of D/HH faculty accommodation and found that the students' total values were higher than the D/HH faculty labor and accommodation costs. Furthermore, deaf faculty classes have benefited students from their higher education and career goals. This study also adopted an exploratory sequential mixed methods design to examine D/HH faculty experiences with accommodation and their contributions. D/HH faculty members emphasized financial support, the training of sign language interpreters in higher education, and financial resources for International Sign interpreters. By identifying the quantitative values of D/HH faculty contributions, the stigma of "too expensive" when accommodating D/HH faculty members is erased, and this is transformed into a new perspective on "the worth" of accommodating D/HH faculty members to engage their contribution and ultimately benefit university students' learning and career goals. Therefore, this study recommends that universities recognize the importance of expanding financial resources,

establishing disability services, and training academic sign language interpreters. The study concluded that developing disability services for deaf and disabled faculty members could expose their contributions to society and student education.

Ethics Review Board
This study was approved by the Institutional Review Board of the University of Tsukuba (2021-204A, 2021-205A).

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