Journal of Accessibility and Design for All

Volume 10, Issue 2. (CC) JACCES, 2020. ISSN: 2013-7087

STUDY OF INTERIORITY APPLICATION IN DEAF SPACE BASED LECTURE SPACE

CASE STUDY: THE CENTER OF ART, DESIGN & LANGUAGE IN ITB BUILDING

Rachmita Maun Harahap[1]*, Imam Santosa[2], Deddy Wahjudi[3], Widjaja Martokusumo[4]

[1] P.hD Candidate of Science of Art and Design, Bandung Institute of Technology

[2,3,4] Senior Lecturer of Bandung Institute of Technology

*Corresponding author

[1]ORCID: *0000-0001-8823-0350*

[1]mitha_hrp@ymail.com

Received: 2019-10-01 | Accepted: 2020-11-15 | Published: 2020-11-30

Abstract: Many lecture space facilities today are included in audism category because they do not yet have space design regulations for hearing disabilities. As a result, students with hearing disabilities, who are not identified from the start, require more time to sustain their education. This study aims to apply related theories including DeafSpace principles and interiority to find lecture space settings that can support the behavior of SHD's. Lecture spaces in the CADL-BIT building are not currently designed specifically for users with disabilities in application of interiority. This research used a qualitative method with a case study approach. Data is collected through observation, simulation, and interviews to explore the experience of space users. The research results showed that spatial experience was influenced by behavior, activities and space. The behavior of students with hearing disabilities in lecture space settings is influenced by interiority. There are lecture classrooms found to form of interiority, which are u-shaped furniture settings, easy visibility to read facial expressions and lips movements, and can interact with each other, bright lighting (not dim), wall colors according to pastel colors, plain wall material, and acoustics are

Harahap, R. M., Santosa, I., Wahjudi, D., Martokusumo, W., (2020). Study of interiority application in deaf space based lecture space. Journal of Accessibility and Design for All, 10(2), 229-261. https://doi.org/10.17411/jacces.v10i2.245

used sound absorbers. This research is expected to be beneficial for scholarship about the DeafSpace design, community, and building based on social culture.

Keywords: hearing disability, audism, *Deaf Space*, interiority, lecture classroom.

Introduction

Audism, which is discriminatory behavior towards people with hearing disabilities, stays an issue in managing public space (Humphries, 1977). Audism in public spaces drives people with hearing disabilities (deaf) to adapt to normal people's preferences (without hearing abilities) (Harrington, 2002; Jacobi, 2009; Berke, 2018). In the education context, audism has built a hurdle for people with hearing disabilities to accept the full features from the learning and teaching activities. An increasing number of people with hearing disabilities has resulted in an increasing demand for supporting teaching and learning facilities for them. An inclusive learning system needs to consider people with disabilities to access equally all features in education (Bauman, 2005; Murray et.al., 2014), and end audism in the inclusive education system.

Applying inclusive education system can be done by, for example, adjusting the lecturing space layout in such a way to facilitate people with hearing disabilities to interact with one another. This layout enables people with hearing disabilities to read other person's lips and gestures. Visibility, lighting, colour, and acoustics setting of the classroom are also essential for people with hearing disabilities to take part more actively in learning and teaching activities. (Bauman, 2005; Guardino, 2016).

People with hearing disabilities rely heavily on the visual sense, in which they are overly sensitive to things related to visual (Bauman, 2005: Guardino, 2016). A study by De Parny (1984); Worrel, (2011); Martins &

Volume 10, Issue 2. (CC) JACCES, 2020. ISSN: 2013-7087

Gaudiot, (2015); Guradino, (2016) said that the role of visual senses is vital for people with hearing disabilities. Based on this, the lecture space layout should be arranged to facilitate people with hearing disabilities to optimise their sense of sight to concentrate on learning, easy to read the expression or teacher's lips. Other settings also include how easy for the students with hearing disabilities to see the blackboard, the lighting settings (bright and not glare), the use of non-textured wall material, applying soft colours and supportive space acoustics.

Interiority is a potential eye sense experience that can be sharpened through space experience in communication and orientation (Harahap, 2019). The proper lecture space interior is needed by students with hearing disabilities (SHD's) to support their physical, psychological, and social independence. Harahap (2019) states the purpose of interiority is to identify the spatial design concepts following the behavior characteristics of hearing aid users (HA), without hearing aid (WHA), and cochlear implant (CI). Interior settings in lecture space must be applied in a way so that both students with hearing (SH) and students with hearing disabilities (SHD's) can carry out learning and teaching activities independently.

Architectural obstacles in the education sector, especially in the inclusive higher education system, prevent SHD's from being able to learn and experience teaching process optimally, thus unable to access equal features compared to SH.

The DeafSpace concept arises as one of the interior design strategies that apply the needs of people with hearing disabilities in public spaces (Harahap, 2019). DeafSpace application can be done by the lecture space interior layout setting to support SHDs. The case study in this study is a lecture space at the Centre of Art, Design and Language Building at Bandung Institute of Technology (ITB) because this building has not met its accessibility aspects. The lecture space in the CADL building is one of the main lecture space used by all students, including students with hearing disabilities (SHD's).

This study aimed at application related theories to seek lecture space settings that could facilitate and accommodate the needs of SHD's in the learning process. Understanding interiority and its elements can benefit the field of interior design to meet the needs of people with hearing disabilities. This research did not aim to generalization, but it is idiographic, by taking a case study at the CADL-ITB building. The lecture space's current setting is not specifically designed to shape interiority, which is the most basic thing in creating a space experience.

Literatur Review

The Deaf Space Conception

Communication activity on people with hearing disabilities focuses on the visual space. The DeafSpace conception in interior design accommodates the needs of people with hearing disabilities in public spaces. DeafSpace focuses on increasing visual space quality for people with hearing disabilities. DeafSpace conception has 5 principles (figure 1), i.e., 1) space and proximity, 2) sensory reach, 3) mobility and proximity, 4) light and color, and 5) acoustics (Bauman, 2005; Worrel, 2011, Chiambretto & Triilingsgaard, 2016).

Figure 1. DeafSpace design guidelines (Bauman, 2005; Chiambretto & Triilingsgaard, 2016)

Figure 1.1. Space and Proximity

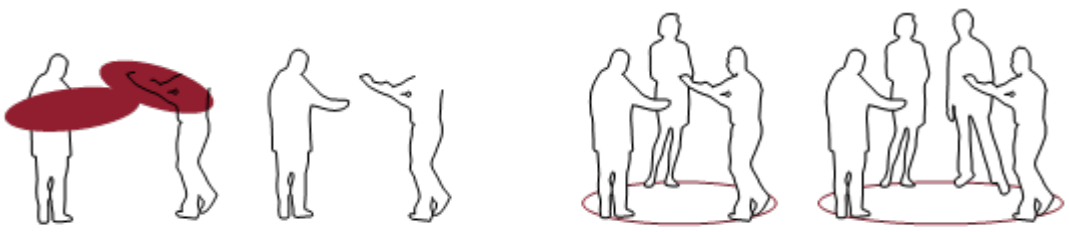


Figure 1.2. Sensory Reach

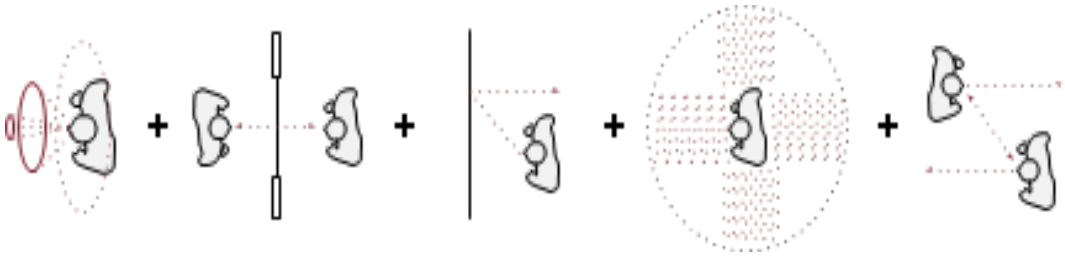


Figure 1.3. Mobility and Proximity

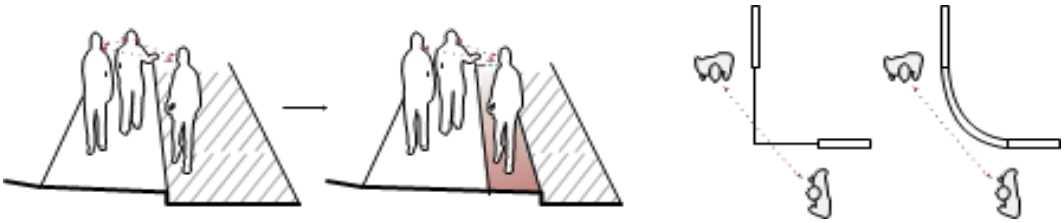


Figure 1.4. Light and Color

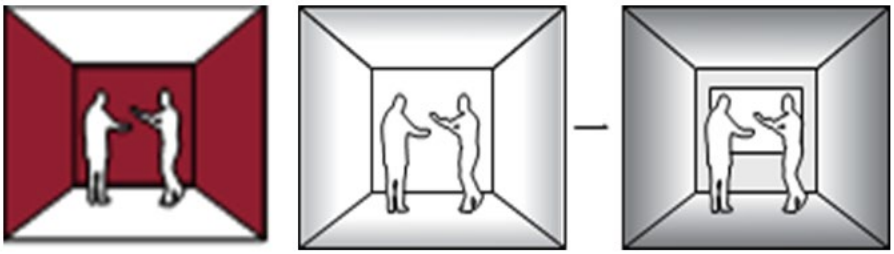
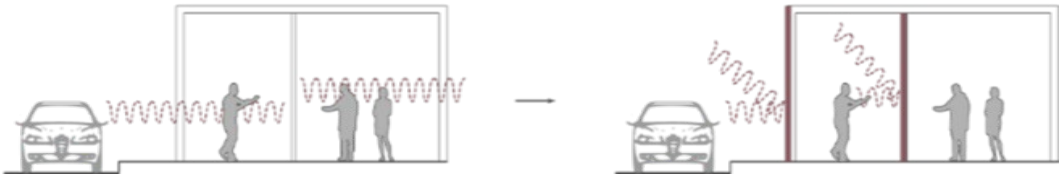


Figure 1.5. Acoustic



Interiority of Hearing Disability

Interiority is a combination of non-physical images in the realm of his mind with the experience of a physical or interior place that contributes to the emotional relationship between humans and places (Kole 2017, Harahap, 2019). Space experience cannot be separated from human experience itself. According to Leslie (1998; in Kole, 2017), the processing and rebuilding of human experience are reflected in the activities of telling stories about the

time that has passed. The experience of a place can be assumed as a place personalization, that is, giving a space a personality or identity. The identity of space can be achieved by connecting the outer skin of buildings with interior elements, such as furniture, colour, light, movement, finishing, and so on (Rice, 2006; Maharani, 2014).

Interiority in people with hearing disabilities is defined as an element that has measurement criteria for body movements and communication modes (visualization cues) that affect the quality of accessibility in a space. The elements are visibility, lighting, space layout, acoustics, colours, and materials. If the element criteria are not met, the quality of the interior elements in the space will be affected. This likely to cause problems for hearing disabilities, such as communication difficulties or difficulties in understanding certain spatial conditions (Kloese and Ramadani, 2012 in Harahap, 2019).

Figure 2. Phenomenon of hearing disabilities

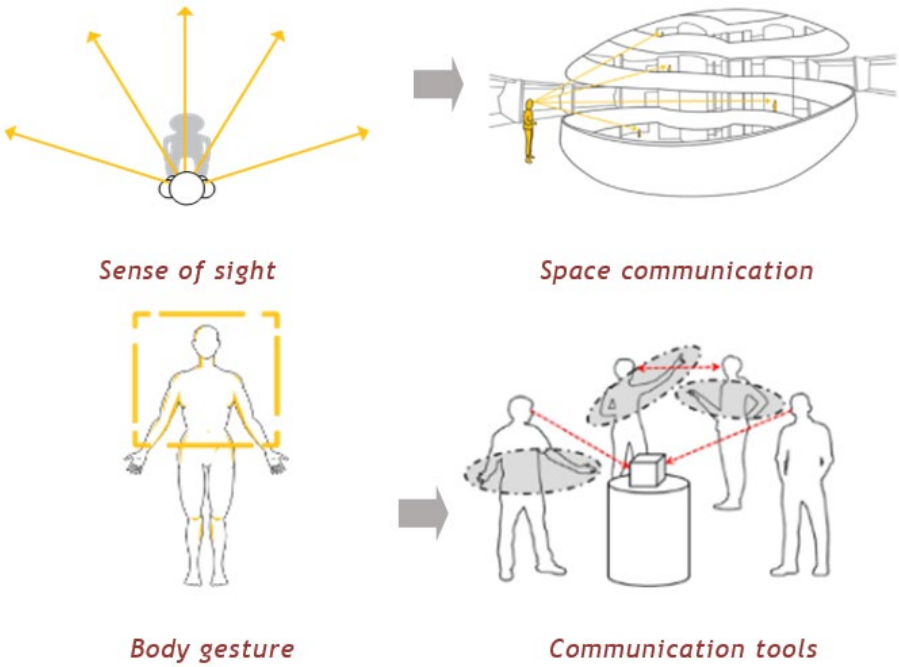


Figure 2 shows the phenomena of hearing disabilities behavior that requires dimensions of gesture (body) and visual senses to help communication in a

space. An example of planning that accommodates DeafSpace concept of hearing disabilities behavior to ease communication.

Methods

This research used a qualitative method. This qualitative research is specifically directed towards the use of case study methods (Creswell, 2013). A strategic case study is suitable if the main question of study centres on the "how" and "why" aspects (Yin, 2015). The qualitative method was chosen upon consideration that the characteristics of auditory disability behavior could be seen through the induction process, with empirical observation through observation, interviews, compiling questionnaires, simulation and documentation (Miles and Huberman, 1994). The research location was chosen in the ITB CADL building, considering that ITB is a university that accepts students with disabilities in high-level countries, and later has an inclusive campus that centred in one area.

Research Sample

Samples were selected with particular criteria based on certain theories following the research objectives. This was under the consideration that sample would really serve as the representative of the phenomenon being studied. (Starus & Corbin, 1990). The theory observed in this research is the behavior of people with hearing disabilities categorised based on their types of deafness, the use of assistive devices, and the phenomenon of the spatial experience felt by students with hearing disabilities (SHD's) to lecture space setting which is related with the DeafSpace conception.

Determining the sample size is based on the principle of information saturation. If the sample taken holds information that is still needed, a sample that is estimated to contain information that has not been obtained is pursued again. Conversely, if you add the same sample to obtain the same information, it means that the number of samples is sufficient because the

Volume 10, Issue 2. (CC) JACCES, 2020. ISSN: 2013-7087

information has become saturated. Based on this method, the sample taken stopped at 72 peoples. As many as 60 respondents are SHD's active/alumni/dropouts (DO) regarding of space experience of lecture space at 12 local universities (Table 3) and 12 respondents of SHD's active/alumni/DO participating in a simulation regarding the user connection with lecture space setting at CADL-ITB building (Table 4).

Instrument

This research was conducted in several stages of data collection and data analysis (Creswell, 2013). The observation stage was carried out at the lecture space on the 7th floor of CADL-ITB building. An Observation collected data in the form of interview data and photo documentation on interior elements in the lecture space, e.g. the setting pattern of furniture, visibility, lighting, colour, materials, and acoustic. Data were then analysed according to the DeafSpace concept as proposed by Bauman (2010). The three main components that had been observed were: a) space settings, b) activities, refers to what is done by SHD's in a lecture, and c) interiority that arises from the relationship between lecture space setting and SHD's behavior.

Research Procedure

Following the research problem and research objectives, the outline of the research can best described as follows:

a. Preparation stage consists of:

1) general observation stage, 2) collecting secondary data collection, and 3) making / composing two question instruments for respondents, namely, i.e., the questionnaire instrument lecture space experience questions, and questionnaire and simulation instruments. 4) the stage of sketching the physical space and phenomena of activities that occur, as well as taking photographs for the validity of data validity, and 5) the general interview

stage to take responses from respondents and to determine samples to represent respondents for further interviews. 6) the tryout stage, is a testa test conducted before the main interview is conducted. This stage is to determine the level of validity and reliability.

b. Implementation stage:

1) Mapping SHD's behavior by questionnaire field observation stage. 2) Visiting respondents to interview them. As many as 60 respondents in 12 cities and another 12 respondents taking part in the simulation in the lecture space at CADL- ITB building. This unstructured interview stage is for certain respondents who are representative of the phenomena taken. 3) Completing and classifying data according to respective operational variable groups. 4) Analysing and interpreting data. 5) Drawing conclusions based on the data analysis result. 6) Conducting a discussion. 7) Drawing research conclusions and make suggestions. 8) Making a research report.

Data Collection Methods

The initial stage of this research is to explore things that can influence the characteristics of SHD's behavior during the learning process in the lecture space. Unequal learning services in higher education often occur when lecturers do not pay attention to the presence of disabled students in lecture space. Lecturers will be able to provide a problem-based learning process (Fauziah, et al., 2017) if students with hearing disabilities do not understand the problem of the prepared space element. With literature that focuses on learning space experiences that can serve students to learn (Zollinger, Guerin, Hadjiyanni & Martin, 2009), lecturers can teach how to deliver learning process including to SHD's with lecture space setting. Applying the lecture space setting based on DeafSpace concept requires adjusting to the SHD's behavior.

The next research stage was conducting a simulated al survey with 12 respondents of SHD's active/alumni/DO in the lecture space on the 7th floor

Volume 10, Issue 2. (CC) JACCES, 2020. ISSN: 2013-7087

CADL-ITB building (table 3). Simulation is part of access socialization of theory lecture space conducted to find out how to work the use of al results. At this stage, a simulation was conducted with 12 participants/respondents. Researcher asked respondents to carry out activities that were normally done in theoretical lecture space while learning takes place. Activities were evaluated from a connection with the respondent's different seating positions: position F1, F2, and F3 (Table 4). Activities undertaken by respondents in theory lecture space related to the layout design of seating position are 1) taking notes or writing, 2) looking at the lecturers' lips and lips movements, 3) seeing sign interpreters or note taker /android, and 4) looking at the blackboard or projector screen/TV text.

The researcher asked respondents to fill in an instrument which rates the lecture space setting from the most optimum to the least optimum. The scores were 4 (optimum), 3 (optimum enough), 2 (sub optimum), and 1 (no access at all). This instrument produced data scoring. An assessment of interior element settings in the theoretical lecture space(classroom for theoretical lessons) were furniture layout patterns (traditional lines, circles, u-shapes, clusters, hollow squares, and chevrons), lighting, colour, material, noise (acoustic), and circulation dimensions.

The researcher then instructed respondents to do a simulation on six different furniture layout patterns; A modification (traditional line), B modification (hollow square), C modification (circle), D modification (u-shape), E modification (cluster), and F modification (chevron). The researcher would then ask the lecturer to teach while circling in the lecture space (the ones for theoretical purposes) and observe whether SHD’s found some difficulties or not during the learning process. The simulation stage of each modification duration was 30 minutes making a total 180 minutes for six pattern modifications.

Research Variable

The variables used in this study are SHD's interaction as the independent variable (Table 1) and the lecture space setting as the dependent variable (Table 2). This study did not test the hypothesis to describe information with the observed variables.

Tabla 1. The independent variable (SHD's)

Indicator	Element observed	Resources	Research tool
Type of activity	Learning and teaching	- Respondents - Field observations	- List of questions - Photography
Behavior characteristics	- Deaf – dumb with hearing aid (HA) - Deaf with HA/without HA - Hard of hearing with HA/without HA - Deaf with cochlear implant (CI)	- Respondents - Field observations	- List of questions - Photography

Tabla 2. The dependent variable (lecture space setting theory)

Indicator	Element observed	Resources	Research tool
Physical	- Setting types - Setting conditions	- Sketches / notes - Photography	- Stationary - Camera
Spatial (DeafSpace concept)	- *Space and proximity* - *Sensory reach* - *Mobility and proximity* - *Light and colour, and acoustic*	- Sketches / notes - Photography	- Stationary - Camera
Independence	- Accessibility - Visibility - Convenience - Element availability	- Interview - Observation	- List of questions

Data Analysis

Due to the exploratory and qualitative nature of this study, the author used content analysis to analyse the data generated (I.e., written notes were taken during the interview sessions) (Dickinson et al., 2016). Data obtained from observations were analysed through categorization. According to Moleong (1989), categorization implies the compilation of data which is considered to have similarities in a particular category.

Data categorization used in this study includes the conditions of setting, activities, and behavior. Data obtained through interviews, both verbally and using sign language (Sign Language of Indonesia /BISINDO). Data were then analysed using content similarity analysis method. Content analysis is a scientific analysis of content and communication messages. The process of extracting data was done one by one from each respondent. Trends and similarities acquired from the content analysis include the settings which were chosen as places of activity. Data compilation was added with description and explanation techniques.

Result and Discussion

Analysis of Research Location Data

The location of the research object in the CADL (Centre of Art, Design and Language) building is located in Bandung Institute of Technology (ITB) campus complex, a total of 7 floors and an area of 7,866, 28 or approximately 7.8 hectares (Figure 2 & Figure 3), data of Directorate of Facilities and Infrastructure-BIT, 2017). CADL is arts and language Centre intended to develop the support of creative industries and linguistics that have been recognized as important supports in the international research competition. This building has been equipped with various facilities that can support the needs of further research on art and design in Indonesia.

Figure 3 shows that the CADL – ITB building has not provided available signs, both visual signs or information clues, on the exterior and interior. This situation makes SHD's difficult to access. Figure 4 shows the path setting from the ground floor lobby entrance to the 7th floor where the lecture space is situated. The parking area that serves parking and circulation holds the need for access to see the presence of vehicles passing in front or behind.

Figure 6 shows the furniture setting (seating position). It turned out that it was not easy for users to see the expression and lip movements, thus, reducing users' ability to hear & comprehend the discussion. The setting of entrance element at CADL building is quite optimum enabling users to have uninterrupted conversations and visual connections without disruption. Glassdoor materials helped to identify activities in the space according to DeafSpace guidelines.

Figure 3. Case location of lecture space in CADL building- BIT (blue). (Source: Site Plan, Directorate of Facilities and Infrastructure/DFI- BIT, 2018)

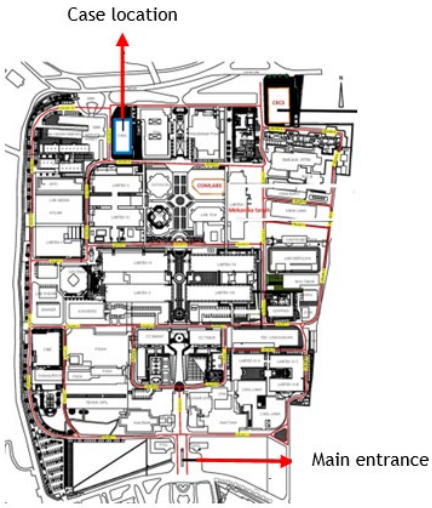


Figure 4. Floor plan 1 of the CADL building at BIT and entrance (red arrow). (Source: DFI-BIT, 2018)

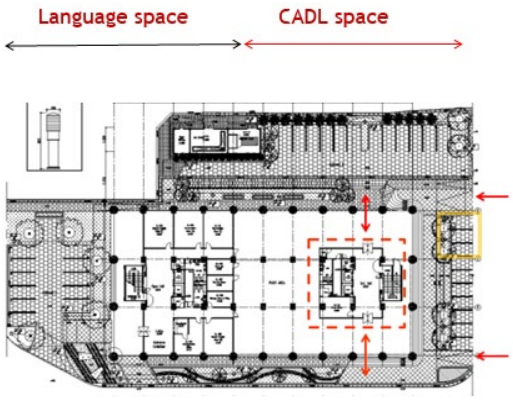
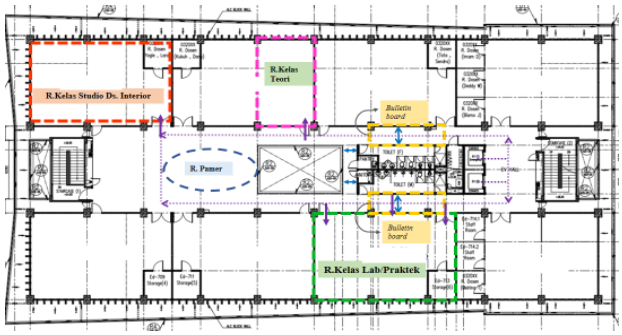


Figure 5. Circulation flow from lobby (elevator) to 7th floor lecture space.Source : (DFI-BIT, 2018) and pyshical appearance of a CADL building at BIT.



Circulation line; : Entrance/exit; Corridor width :

Research result

1. Phase 1 Results

This stage used a questionnaire to selected respondents based on differences in characteristics or physical functions, i.e. hearing aid (HA) users, without HA, and cochlear implants (CI), totalling of 66 SHD's active/alumni/DO respondents regarding user experience towards access to lecture spaces in 12 city universities in Indonesia (Table 3).

The results of data calculation are categorised based on gender and age. Most of the respondents were male (65%) and within the 19-25 years old category (55%). Only 1.67% aged 45 years and above. In the category of deafness and the use of assistive devices, as many as 56.7% of the respondents were deaf. Ear models hearing aid occupied the top category with (61%) and the lowest hearing aid models used were cochlear implant users (3.3%). In terms of education and employment, most of the respondents were undergraduate (75%) and only 2.1% was in doctoral programs (2.1%). The majority of respondents worked as active students (48.3%), and only 3.5% worked as civil servants.

Tabla 3. Number of respondents of student with hearing disabilities

No	University area	Number of respondents		Total (person)
		Face to face	via Email	
1	Jakarta	13	3	16
2	Depok	1	2	3
3	Banten	1	2	3
4	Bandung	7	2	9
5	Semarang	2	1	3
6	Solo/Surakarta	-	5	5
7	Yogyakarta	1	2	3
8	Malang	9	-	9
9	Surabaya	1	1	2
10	Denpasar	6	1	7
11	Banda Aceh	-	1	1
12	Tangerang	5	-	5

Based on the results regarding the space experience perceived by users on physical access, the lecture space is not designed for people with hearing disability in university (answered by 61.67% respondents). While 46.73% of respondents on non-physical access issue stated that lecture space in universities do not facilitate proper accommodation (sign language interpreter, and special assistance). As many as 63.3%. Respondents claim that assistive technology facilities (a feature of speech recognition via speech to text from smartphones that have been applied from play store, live transcribe, notetaker / CART-specific projectors) were not yet facilitated by universities.

2. The result study of phase 2

This stage was conducted by questionnaire of 12 respondents/participants in the lecture space of the CADL-ITB building (Table 4).

Tabla 4. For 12 respondents of SHD's (active/alumni)

Respondent's name	University origin	Majors	Semester
R1	University of Mercu Buana in Jakarta	Interior design	6
R2	University of Esa Unggul in Jakarta	Interior design	2
R3	Unikom Bandung	DKV	10
R4	University of Pembangunan Jaya in Banten	Product design	Graduated
R5	National Institute of Technology in Bandung	Graphics design	Graduated
R6	Widyatama Bandung	Graphics design	6
R7	University of Islam Bandung	Management of hospital	3
R8	University of Mercu Buana in Jakarta	Interior design	Graduated
R9	Bandung Institute of Technology	Business	Graduated
R10	Sekolah Tinggi Hukum Bandung	Law	DO
R11	Sekolah Tinggi Ilmu Teknologi in Bandung	Islamic Education	5
R12	Widyatama Bandung	Graphics design	6

This stage aimed at identifying things that are expected to influence the characteristics of SHD's behavior during the learning process in the theoretical lecture space. Based on the results, factors that affect SHD's behaviors are: 1) The Cause of deafness: most respondents have deafness since birth (75%), caused by accidents (8.3%), and caused by a disease (16.7%). 2) The use of assistive devices: most respondents were Hearing Aids users (58.3%), followed by users without Hearing Aids (25%), and Cochlear Implant Users (16.7%). 3) Communication methods: the largest percentage of communication methods used are both sign language and verbal communication at 41.66% each, while the combination of sign language and verbal/aural is 16.73%.

Setting lecture space, which is used by SHD's space experience in conducting their learning and teaching activities, has shaped the interiority. Several elements of interiority that are captured in behavior of students with hearing disabilities are as follows: a) Capturing the alteration on their surroundings by maximising their visual sense. b) Requiring movement space to accommodate two-way communication or more using sign-languages. c) Requiring a wide visibility range to facilitate visually capturing object from a

far distance or the opposite direction. d) The tendencies of imperfect body posture, because an impaired hearing system could cause issues in the human spinal nerve system.

The above behavior and need specification that arises from the research findings can explain several applications on element characteristics on a space design based on deaf space conception. This space design allows accessibility for Students with Hearing Disabilities to communicate, reduce visual hurdles, and gain independence in learning and teaching activities.

3. The results study of phase 3

The results of the final stage of the study carried out a simulation of furniture setting (seating position) in lecture space of the CADL-BIT building (Table 6). The result of furniture setting data calculation shows that the highest value (optimal category) is the U-shape pattern (66.7%). The optimal category is Circle-shape pattern (16.7%), the suboptimal category is on the Hollow square shape and Cluster shape (8.3%). The inaccessible categories are Traditional line and Chevron (0%) pattern settings.

As seen in table 5 above, the majority of F1, F2 and F3 furniture layouts stating that u-shape expresses independence, ease (visibility) and comfort. This includes one required character from the DeafSpace conception on the principle of sensory reach, mobility and proximity. Also, it connects with the aspect of interiority, to know the location of places or to reach that place without the help of others, to be able to learn on their own, to feel safe in their activities, and to be able to see each other between lecturers and students. Comfort becomes the factors that influence the SHD's behavior on the U-shaped furniture layout pattern.

An analysis on the comparison of the characteristics and the respondents' behavior and the layout of lecture space, conducted on each type of deafness category and the use of assistive devices, shows that an effective furniture setting pattern is also a U-shaped layout. Reasons for selecting

respondents from the lecture space with the u-shape pattern on aspects of interiority, namely :

a. Accessibility and visibility, related to the proximity of the distance, easy to see the expression and lip movements of lecturers and proper accommodation (whiteboard, LCD projector and so on).

b. Convenience, related to being able to focus learning without interrupting visualization movements, for example lighting, colour, material, and noise

c. Independence related to being able to interact with each other between lecturers and students.

Tabla 5. Summary analysis of comparison result on the four types of deafness categories and the use of tools to seating arrangements is chosen in u-shape patterns

Types of deafness category & use of assistive devices	Accessibility, independence, and comfort needs	Interiority factors
F1: Deaf -dumb (hearing aids/without hearing aids)	- Choose seating arrangements in U-shape patterns - Easy to interact - Easy to see the lecturer's 'lips' movements - No need to turn back	- Through visual sign - Gestures/cues
F2: Deaf (hearing aids/without hearing aids)	- Choose seating arrangements in U-shape patterns - Easy to interact - Easy to see the lecturer's 'lips' movements - No need to turn back	- Through of visual sign - Gestures/cues
F2: Hard of hearing (hearing aids/without hearing aids)	- Choose seating arrangements in U-shape patterns - Easy to interact - Easy to see the lecturer's 'lips' movements - No need to turn back	- Through of visual sign - Written / verbal - Gestures/cues
F3: Deaf (CI)	Whether or not to choose seating arrangement of U-shape patterns - Easily capture information - It's easy to see the lecturer's 'lips' movements - No need to turn back	- Through sense of hearing and visual sign - Gestures - Written

Volume 10, Issue 2. (CC) JACCES, 2020. ISSN: 2013-7087

Research Findings

Some research findings in field contained two data, namely physical data and non-physical data. Physical data findings are findings obtained by interiority in lecture space setting in accordance with the purpose of study, while non-physical data findings are findings that are based on problems that arise in physical data.

1. Physical data findings, as follows: a) The condition of formation of lecture space is influenced by behavior of persons with disabilities, activities and spaces. b) Lecture space setting that are found to form interiority; interior in classroom setting based on DeafSpace. c) The role of interiority in lecture classroom setting can support the behavior of students with hearing disabilities. This research is expected to provide benefits for science about interior design.

2. Non-physical data findings, as follows: a) Classrooms are perceived by students as classrooms for learning and teaching activities. b) In the use of lecture space for students with hearing disabilities towards interiority.

Physical Data Findings

A. Finding 1: The condition of the formation of the lecture space is influenced by the behavior of persons with disabilities, activities and spaces.

Based on research conducted on classrooms that are considered as cases, it can be seen that the condition of the classroom setting can encourage the tendency for space activities to occur, where both are affected by hearing disability student behavior. The following will describe the behavior conditions (physical) of each lecture space setting.

The condition of the classroom theory is as follows: a) Traditional line-shaped furniture layout; difficult to interact with each other. b) Visibility (visibility) can not read the expression and lecturer lip movements. c)

Lighting is quite bright and not glare from the sun. d) The color matches the pastel color. e) Plain or non-textured wall materials, partially transparent doors, easy to see the conditions outside the space. f) Acoustic; no silencer.

The condition of the above theory classrooms encourages a tendency towards activities undertaken by students with hearing disabilities: 1) learning and teaching, 2) Group discussion, and 3) Coursework

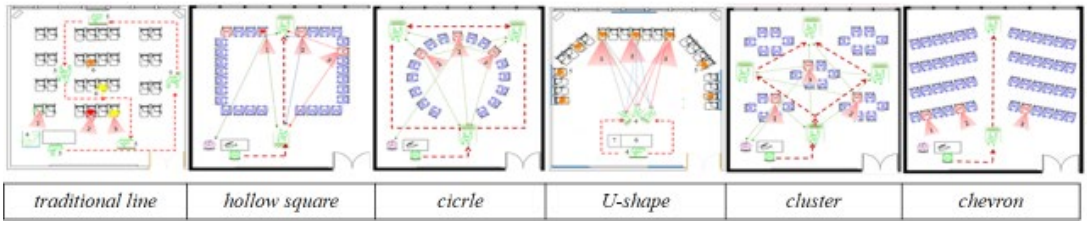
The settings of these elements that affect the formation of interiority are:

- Physical accessibility of space (convenience)
- Visibility (comfort of the eyes / visual senses
- Independence (interaction between spaces and lecturers).

B. Finding 2: Setting lecture space found to form interiority; interior in classroom setting based on deaf space.

Analysis of lecture space settings found to form interiority that fits the criteria of DeafSpace character, namely furniture layout sitting position 6 types of patterns (traditional line, hollow square, circle, U-shape, cluster, and chevron), visibility, lighting, color, material and acoustics. Shows the formulation of analysis of results of simulation of 6 different types of classroom setting patterns that are appropriate are u-shape patterns. The U-shape pattern in the sitting position of students with hearing disabilities facilitates communication and interaction with one another clearly compared to the other 5 patterns. In addition, lecturers can pay attention to which senses are functioning better, to determine the direction of lecturer position more effectively. Can be seen in figure 7.

Figure 7 Furniture layout 6 types of patterns and reactions of sitting position of students with hearing impairments



Seen in table 6, it shows that the setting pattern of the lecture space on aspects of interiority, namely the layout of furniture (sitting position), visibility, lighting, color, material and acoustics are u-shape shapes including one of the character needs in the theory of deaf space on the principle of sensory reach and mobility and proximity, in addition to aspects of interiority, among others, can find out the lecture classroom settings to reach the space without the help of others, can learn on their own, feel comfortable and secure their activities, and can see each other. In the visibility (ease) and independence of students with hearing disabilities make more use of the senses of the eye, namely seeing or reading communication in the space while comfort is not a priority for students with hearing disabilities. Comfort is seen more as a consequence due to the application of deaf space on the principle of space and proximity and light and color. It is known that light and color can cause a feeling of comfort other than security. That is why hearing disability students feel comfortable in the lecture space. Comfort is also a factor influencing the behavior characteristics of students with hearing disabilities to the u-shape lecture classroom setting.

.Tabla 6. Summary Analysis of comparison of six types of furniture layout patterns in lecture space.

Type of furniture layout pattern	Furniture layout (seating position) SHD's users			Aspect of Interiority
	Furniture 1 (F1)	Furniture 2 (F2)	Furniture 3 (F3)	
Traditional line	senses of eye	senses of eye	senses of hearing + eye	Not independent, visibility and comfort are disturbed
	difficult to capture information (reading the lecturer lips / whiteboard / projector's)	difficult to capture information (reading the lecturer lips / whiteboard / projector's)	rather difficult to capture information (reading the lecturer lips / whiteboard / projector's)	
	interact less	interact less	interact less	
	reaction looks back	reaction looks back	reaction sometimes or not looking back	
Hollow square	senses of eye	senses of eye	senses of hearing + eye	visibility and comfort quite disturbed, not independent except seating position 3 (F3)
	rather difficult to capture information (reading the lecturer lips / whiteboard / projector's)	rather difficult to capture information (reading the lecturer lips / whiteboard / projector's)	capture enough information (lecturer / whiteboard / projector)	
	interact enough	interact enough	interact enough	
	reaction looks back	reaction looks back	reaction sometimes or not looking back	
Circle	senses of eye	senses of eye	senses of hearing + eye	Visibility is lacking, comfort is quite disturbed, quite
	rather difficult to capture information (reading the	rather difficult to capture information (reading the	capture enough information (lecturer / whiteboard /	

Type of furniture layout pattern	Furniture layout (seating position) SHD's users			Aspect of Interiority
	Furniture 1 (F1)	Furniture 2 (F2)	Furniture 3 (F3)	
	lecturer lips / whiteboard / projector's)	lecturer lips / whiteboard / projector's)	projector)	independent
	interact enough	interact enough	interact enough	
	reaction does not need to look back	reaction does not need to look back	reaction does not need to look back	
U-shape	senses of eye	senses of eye	senses of hearing + eye	Very visibility, comfortable, independent,
	easily capture information (read the lecturer lips / whiteboard / projector's)	easily capture information (read the lecturer lips / whiteboard / projector's)	easily capture information (read the lecturer lips / whiteboard / projector's)	
	very interacting	very interacting	very interacting	
	reaction does not need to look back	reaction does not need to look back	reaction does not need to look back	
Cluster	senses of eye	senses of eye	senses of hearing + eye	impaired visibility and comfort, not independent,
	difficult to capture information (read the lecturer lips / blackboard / projector)	difficult to capture information (read the lecturer lips/ blackboard / projector)	just capture information (read the lecturer lips / blackboard / projector)	
	interact less	interact less	interact less	
	Looking back	Looking back	Looking back	
Chevron	senses of eye	senses of eye	senses of hearing + eye	impaired visibility and comfort, not independent,
	difficult to capture information (read the lecturer lips / blackboard / projector)	difficult to capture information (read the lecturer lips/ blackboard / projector)	difficult to capture information (read the lecturer lips/ blackboard / projector)	
	interact less	interact less	interact less	
	reaction looks back	reaction looks back	reaction sometimes or not looking back	

You can see table 4 of F1 seat code. F2 and F3. Can be seen Table 6 Seated seat number of students with hearing disabilities.

Volume 10, Issue 2. (CC) JACCES, 2020. ISSN: 2013-7087

Setting lecture space, which is used by SHD's space experience in conducting their learning and teaching activities, has shaped the interiority. Several elements of interiority that are captured in the behavior of students with hearing disabilities are as follows: a) Capturing the alteration on their surroundings by maximising their visual sense. b) Requiring movement space to accommodate two-way communication or more using sign-languages. c) Requiring a wide visibility range to facilitate visually capturing object from a far distance or the opposite direction. d) The tendencies of imperfect body posture, because an impaired hearing system could cause issues in the human spinal nerve system.

The above behavior and need specification that arises from the research findings can explain several applications on element characteristics on a space design based on deaf space conception. This space design allows accessibility for Students with Hearing Disabilities to communicate, reduce visual hurdles, and gain independence in learning and teaching activities.

C. Finding 3: The role of interiority in lecture classroom can support the behavior of students with hearing disabilities during productive learning and teaching processes.

In essence, self-awareness of students with hearing disabilities who can identify themselves in lecture classroom is called interiority. Implicitly, the inner self of students with full hearing disabilities that identifies with behavior characteristics of lecture classroom setting. It can be proven that the behavior is seen in students with hearing disabilities to reactions to furniture settings in sitting position, visibility, lighting, color, material and acoustics. This is explained by the findings of the process of independence, visibility, and comfort of the interiority or indicators of hearing disability behavior. Interiority can occur when students with hearing disabilities consider themselves to be subjects of space users and can distinguish themselves from objects of physical space.

The interiority that is present in persons with hearing disabilities is the configuration of behavior aspects (physical and spatial) related to the process of self-formation. The process of self-formation in this study can be seen from the learning and teaching process that starts from the intuition to end on meaning. Interiority is created when the six aspects are integrated and productive.

Conclusion

It was found in study, how the interiority in lecture classroom setting can support the behavior of students with hearing disability during productive learning and teaching processes. Based on results of analysis conducted previously with consideration of creating interiority in lecture classroom DeafSpace-based it can be concluded, as follows:

Principle 1: Space and proximity

- The interiority of characteristics of hearing disability in space and proximity forms a comfortable space for users with hearing disability to move. Often hearing disability users need their ability to communicate. Facial and gestures are very important for users, so users need landscape space to communicate or sign language. In communicating, the space needed by users with hearing disability is different from hearing people.

- The principle of space and proximity is applied in several aspects of space, namely the furniture layout, and physical appearance of elements. The problem of shape or pattern of space that is tailored to characteristics of hearing disability. For example, furniture layout patterns that are deemed appropriate for characteristics of hearing disability are shaped like a semicircle or u-shape because they are flexible, effective, broad, and dynamic. This form or pattern is chosen based on the user's habit of hearing disability in their

Volume 10, Issue 2. (CC) JACCES, 2020. ISSN: 2013-7087

activities. Unconsciously a group of users with hearing disability will form a semicircle or curve in order to be able to see everyone or interact with each other. They will avoid squares or elongated shapes that can block the view.

Principle 2: Sensory reach

- The interiority o characteristics hearing disability in sensory reach that is applied to help or enhance the sensory stimulation they have. By using other senses, users of hearing disability are expected to be able to read situations that occur in class lectures. For example, the u-shaped sitting position in the middle part easily sees the lecturers' lips or movements, also blackboard or projector screen, and addition of transparent glass on lecture classroom door so that they can find out activities outside if there are people who are interested to enter.

- The use of signage for lecture classroom is also needed as a marker. Examples of the use of signage exit signs or evacuation routes, visual bell lights provide information of fire or danger signs installed in each lecture classroom. With this signage, users with hearing disability can recognize the danger without having to be warned in the form of audio.

Principle 3: Mobility and proximity

- The interiority of characteristics of hearing disability requires a large amount of wiggle space compared to the needs for mobility of hearing persons. The need for space for hearing disability users is influenced by distance and area of vision or closeness. This principle is based on characteristics of hearing disability regarding how to communicate. In communicating, users with hearing disability rely on their visuality. If users are too focused on the conversation, they become less concerned about the surrounding conditions. But they can still pay attention to conditions around, so it requires a large space to move to

allow them to continue to pay attention to elements of circulation path (corridor) and the interlocutor.

- The space to be discussed in this principle is the extent of corridor road and the use of stairs or ramps. Calculation of road and the use of stairs or ramp need to be considered in the comfort of hearing disability users.

- The width of the road in this lecture classroom is designed wider than the width of the road, so that users with hearing disabilities can freely pay attention to the surrounding conditions. The width of the corridor path (or pedestrian) in the lecture space is about ± 3.00 m^2.

- Ramp elements in space for all users including physical and sensory disabilities to make it easier for users to move to different heights. Meanwhile, the use of stairs in this lecture classroom has some special attention in order to be able to make it easier for users with hearing disabilities to access from different floors. The stairs used in this lecture classroom have a width and a length that is wider than the usual stairs. The steps in the lecture classroom are also sloping so users can easily access the room.

Principle 4: Lighting, Color and Material

- The interior of the characteristics of persons with hearing disabilities in the elements of light and color, namely the selection of color and processing of light in the room Color and light affect the hearing impaired psychology. In order for them to see and read the situation comfortably, the color chosen must contrast with the color of the skin. That way, students are deaf when watching someone speak or sign language.

- The color choices in this lecture room tend to be pastel colors. However, because the lecture class space is adapted because of the

points of hearing impaired persons, but also some selected public and private space areas are fresh colors and can increase their knowledge of colors.

- Ideal light processing required by DeafSpace design is light that is gentle on the eyes, not blinding, and avoids dark or dim spaces.
- In this lecture space, hearing impaired users typically make more use of natural lighting. The use of large openings allows natural light to enter the room so that there are no dim or gloomy (dark) corners. This lecture space uses skylights in several large spaces. In another room, a large window is provided so that natural light can enter freely and reduce the cost of using artificial light.

Principle 5: Acoustic and vibration

- The processing of acoustic and vibration elements in the lecture room for hearing impaired users is something that needs to be considered so that users can feel comfortable. Even though users have a hearing deficiency, those who use hearing aids (ABD) and cochlear implants (CI), loud sounds and even the sound of cutting machines practicing in the practical classroom can interfere with their hearing. Therefore, the ideal acoustics in a quiet and quiet room. However, quiet acoustic processing does not have to be applied in every room.
- Acoustic processing can be given to a room that requires calm. For example, in a practicum room that requires pure sound and vibration produced by the sound source, the room can be given soundproof material so that it is not disturbed by outside noise.

Interiority in the classroom setting is based on DeafSpace which is applied to five principles as physical elements that have communication (language) and orientation or visual signs that are implemented in each room. In interiority based on the concept of DeafSpace aims to facilitate users who have hearing impairment to recognize space in the built environment. The spatial design

supports the provision of information through the senses of the eye and the ability to capture vibrations.

The results of the study, physical space (architectural) is not enough to increase independence, so the need for an adaptation process, commonly called interiority. The adaptation process is meant to support interiority in space. Therefore, it can add to the previous theory of the deaf space theory which explains that architectural environment influences the behavior of persons with hearing disabilities (Bauman, 2005; Byrd, 2007; Sirvage, 2011).

This research applies the interiority process in the conception of a good DeafSpace that can improve the independence of students with hearing disabilities in lecture space. Therefore, it can be done to enrich and develop the DeafSpace theory in context of behavior characteristics of persons with hearing disabilities in Indonesia.

The spatial design process does not only reach the problem of problem solving in the space through the configuration of interior elements, so as to reach a certain quality stage. A person with a hearing disability as a user of space will achieve a level of ease (visibility), comfort and independence. When it reaches the level of unification of the space which is then referred to as interiority. The intended self-unification between space and behavior (physical and spatial) becomes important in the midst of various accelerations and developments in virtual technology.

Acknowledgements

This present review includes research evidences which were supported by the Grant Aid for Scientific Research from the Ministry of Education and Culture of the Republic of Indonesia for the Promotion of the Open Session of the Doctor of Arts and Design at the Bandung Institute of Technology.

Furthermore, acknowledgment is also expressed for the partial support of the Chairman of Mercu Buana University, Jakarta. I would appreciate the

promoters Dr Imam Santosa, M.Sn (Bandung Institute of Technology), Deddy Wahjudi, PhD (Bandung Institute of Technology), and Prof. Dipl-Ing Widjaja Martokusumo (Bandung Institute of Technology) for the assistance of expert guidance and technical contributions to my research dissertation.

References

[1] Bauman, H-Dirksen L. (2004). Audism: Exploring the Metaphysics of Oppression. *The Journal of Deaf Studies and Deaf Education*, Volume 9, Issue 2, April 2004, Pages 239–246

[2] Bauman, H-Dirksen L. & Murray, J. J. (2014) : DeafSpace: an architecture toward a more livable and sustainable world chapter author (s) Hansel Bauman. Book Title: Deaf Gain. Raising the Stakes for Human Diversity. Published by: University of Minnesota Press. (2014)

[3] Bauman, H. ,et.al. Deaf Diverse Design Guide. Situs accеass http://www.dangermondkeane.com/ (downloaded on 1-9-2019)

[4] Berke, J. (2019): The meaning and practice of audism an audist attitude can be compared to other forms of discrimination. VerywellHealth.

[5] Burcharth, E. L. & B. Sontgen. (2016): Introduction interiors and interiority, Copyright Publisher. All rights reserved. 2016.

[6] Byrd, T. (2007). DeafSpace. Gallaudet today: the magazien. USA.

[7] Caan, Shashi. (2011) : Rethinking design and interiors, Laurence King Publishing, London.

[8] Chiambretto, Alessia &Asta Kronborg T. (2016): DeafSpace individuality +integration in Gallaudet university by Asta Kronborg Triilingsgaard. Gallaudet university, Washington DC, USA

[9] Creswell, J. W. (2013): Research design qualitative, quantitative and mixed methods approches, SAGE Publications, California

[10] Diani, M.R. (2012): The eye that hears: Architecture for the deaf. Penerbit Lamalera dan Samana Forum, Jakarta.hal.46

[11] Directorate pf facilities and infrastructure, Bandung Institute of Technology. (2016) : Site Plan of Campus and Lecture space in the CADL building. Bandung

[12] Guerin, D.A& Martin, C.S. (2004) The Career Cycle Approach To Defining The Interior Design Profession's Body Of Knowledge. Vol.30 issu 1, Journal of Interior Design.

[13] Fauziah, R., Abdullah, A. G., & Hakim, D. L. (2017). Pembelajaran saintifik elektronika dasar berorientasi pembelajaran berbasis masalah. Innovation of Vocational Technology Education, 9(2)

[14] Harahap, R.M., et al., (2019). Interiority of public space in the deaf exhibition center in Bekasi. International Journal of Sinergi Vol. 23, No. 3, October 2019; p 245-252. http://doi.org/10.22441/sinergi.2019.3.009

[15] Harahap, R.M., et al., (2019). Kajian penerapan desain universal pada ruang kuliah bagi disabilitas pendengaran di perguruan tinggi (studi kasus : ruang kuliah gedung CADL di ITB.
DOI: http://dx.doi.org/10.22441/narada.2019.v6.i1.001

[16] Harahap, R.M. (2020) . Poster : Pengalaman ruang mahasiswa Tuli pada setting ruang komunal di Universitas Mercu Buana. Jakarta.
DOI:10.13140/RG.2.2.29026.35522

[17] Harrington, T. (2002): What is Audism: Introduction. Gallaudet University Library. Retrieved from http://libguides.gallaudet.edu/content.php?pid=114455&sid=989379

[18] Haryadi & Setiawan. (1995):Architecture of environment and beahavior/ Directorate of High Education in Ministry Education and Culture.Jakarta.

[19] Miles, MB & Huberman, AM., (1994): Qualitative Data Analysis: A Sourcebook of New Methods. SAGE. Beverly Hills

[20] Humphrey, T.L. (1997). Communicating across cultures (deaf-hearing) and language learning. (Doctoral dissertation. Cincinnati, OH: Union Institute and University,1977), hal.12

[21] Kloese, DT & Ramadani, K. (2013): Perception: the impact of an impaiment. Maitre EPFL Herve Lissek.

[22] Kole, M. (2017). What Is Interiority? An Interiority Definition, and Why It Matters. https://kidlit.com/2017/10/23/what-interiorityis-and-why-it-matters/

[23] Martins, Laura Bezzera and Gaudiot, Denise MSF. (2012). The deaf and the classroom design: a contribution of the built environmental ergonomics for the accessibility. DOI: 10.3233/WOR-2012-0007-3663. IOS Press

[24] McCarthy, C. (2005): toward a definition of interiority. Sage publications Space and culture.

[25] Moleong L. J. (1994). Method of Qualitative Research: Remaja Rosdakary

[26] Murray, et al. (2014): Supporting social inclusion for students with autism spectrum disorders. Edited by Cathe Little. Routledge. London

[27] Parny, I. de F. De lês etablissements pour jeunes sourdes em France: Bilan ET prospective, 360f. Thesis in architecture. Paris University.1984.

[28] Perolini, P. (2014): Interior Environments: The Space of Interiority Griffith Online. (Griffith University)

[29] Republic of Indonesia. (2016) : Persons with Disabilities, Act Number 8 year 2016. Jakarta

[30] Republic of Indonesia. (2017): Minister of PUPR Regulation No. 14 / M / PRT / 2017. (2017): Ease of building requirements. Jakarta

[31] Republic of Indonesia. (2017):Minister of Research and Technology Dikti Regulation No. 46 of year 2017 “Educationspecial and special education services in university”. Jakarta.

[32] Rice, RE. (2006) Enhancing the quality of teaching and learning: The U.S. experience. First published:25 April 2006. https://doi.org/10.1002/he.201

[33] Sirvage, R. (2012): My point is design. Not to design an environment around me, but to design an environment for all of us. Hales, 2013

[34] Stephanie Watson Zollinger, SW., Guerin, DA., Hadjiyanni, T & Martin, C.S. (2009). Deconstructing Service-Learning: A Framework for Interior Design. Journal of Interior design. https://doi.org/10.1111/j.1939-1668.2009.01022.x

[35] Strauss, A. & Corbin, J. (1990). *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. Newbury Park, CA: Sage Publications.

[36] Worrell, R. A. (2011). Architectural communication accessibility for the deaf and hard-of-hearing in office buildings. The Catholic University of America, Thesis, Washington, D.C, hal.50-59

[37] Yin, R.K. (2015). Case studies: Design and Methods. Jakarta: Rajawali Pers.

Journal of Accessibility and Design for All

Volume 10, Issue 2. (CC) JACCES, 2020. ISSN: 2013-7087

Harahap, R. M., (2020). Study of interiority application in deaf space based lecture space. Journal of Accessibility and Design for All, 10(2), 229-261. https://doi.org/10.17411/jacces.v10i2.245