Effectivity assessment of interpretive signs for biodiversity conservation

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Abstract. The interpretive sign is to communicate specific educational and/or management learning, behavioral and emotional messages to visitors. Interpretive signs are most commonly used for self-guiding trails, or for wayside exhibits at points of interest. This study aims to assess the effectiveness of interpretation signs on biodiversity at the Dramaga IPB Campus. The research was conducted at the Dramaga IPB Campus, Bogor in January-March 2020. This research was conducted through field observations, literature and document studies, and interviews using a questionnaire to 90 respondents classified into the general public, students, and lecturers. The signs effectiveness assessment is approached based on three components: layout, design, and media content. The results showed that the media for interpretation of the Dramaga Campus of IPB as the center for tropical biodiversity information was considered ineffective. This is because there are only seven criteria out of 14, which are considered effective based on the assessment of field observations and the results of respondents' assessments. The criteria that are considered effective are not obstructed by other objects, protected from sunlight and rain, using illustrations, appropriate board height, the suitability of themes, and illustrations' suitability. Eight areas are considered effective, and five areas that are considered ineffective.

1. Introduction
Interpretation is a form of communication that helps people understand the places being visited [1]. Interpretation connects visitors' prior experiences and the new information being presented [1, 2]. In essence, it helps to bridge the gap between what tourists already know and what they want to know [2]. Signs are one of the non-personal media used to provide information for the visitor [3]. Interpretive signs provide an important tool to enhance visitor knowledge and understanding during a natural area experience [4]. several important elements to be considered in sign designing include layout, typography, color, graphics, contour, and the inclusion of a multi-sensory flip-panel [3].

IPB University is one of the universities that have high biodiversity [5]. Efforts to realize IPB's commitment to high biodiversity and the ecosystem on the Dramaga campus of IPB, then on April 22, 2016, IPB declared itself a Biodiversity Campus [6]. A biodiversity campus is defined as a campus that fosters innovative ideas, research, and action that advances biodiversity policy and implementation supports a positive and nurturing relationship between the natural environment and development [7]. A biodiversity campus is expected to be a source of knowledge related to diversity for the campus community and even the community.

One of the efforts made to introduce biodiversity to the community is to install interpretation boards containing information related to biodiversity and the environment in particular habitats. However, even though the media for interpreting biodiversity has been developed on campus, there is
still a decrease in species and even wildlife hunting by the community [8]. This indicates that the community does not have the awareness to protect the existing biodiversity. Increasing awareness is one of the final goals of installing interpretive media [1, 2]. This problem raises questions regarding the effectiveness of the interpretation media available at the Dramaga IPB Campus. The research related to media effectiveness in nature-based settings has not been well established [9]. Given the importance of biodiversity interpretation media to strengthen the role of IPB as a center for biodiversity information, it is necessary to research the effectiveness of the media for interpreting biodiversity at the Dramaga Campus of IPB.

This study aimed to assess the interpretation media's effectiveness in an interpretation board as an information center for the biodiversity campus at the Dramaga Campus of IPB by determining which media elements were effective, ineffective, and ineffective. This research is expected to be an evaluation process for IPB in developing the media for interpreting biodiversity in the Dramaga Campus of IPB. Through this research, it is expected that it can be seen whether installing the interpretation media could support the achievement of university management as a biodiversity campus and what aspects influence it. Thus, the manager can improve and enhance the development of interpretation media in the area. This research is essential to be carried out so that the manager or planner of interpretation media can determine what things must be considered in developing an effective interpretation media to achieve the stated area management objectives. Also, very few research examines the factors that influence interpretive media's effectiveness in their role in increasing visitor knowledge and understanding. Therefore, this research can contribute to developing an effective interpretation medium, especially in protecting biodiversity conservation.

2. Methodology

2.1. Data Collection Method

The research was conducted at the Dramaga IPB Campus, Bogor, in January-March 2020. The method used in this study is a mixed-method approach. The method employed to collect data and information needed is field observation, structured interview, and document analysis.

Field observations were carried out in the Dramaga IPB Campus area by observing the location/placement and position of the boards (suitability to wildlife/plant habitat, number of board locations, path circulation), the design of the boards, the contents of the board material, and the size of the boards. Observations were also carried out to identify the pedestrian path circulation for visitors to the Dramaga IPB campus to assess the installed interpretation boards' location.

Interviews were conducted using a structured interview guide to obtain an assessment from the respondents. Several questions asked to the respondents are related to media design (attractive/interesting to look at, easy to read, relevant, systematic, easy to read), the content of the material (Relevance and systematics), location, and board position. Respondents were divided into three groups: IPB students, IPB lecturers, and the community who visited the Dramaga IPB campus with the minimum age characteristic of 12 years old. Because, at this age, teenagers can think independently [10]. The number of respondents is 90 people, with a composition of 30 samples per group. Respondents were determined using the convenience sampling method, which means that respondents were selected based on their willingness to be interviewed [11]. The general public and student respondents were found at several observation locations on the Dramaga IPB campus. In contrast, for lecturer respondents, they were contacted first regarding their availability to become respondents.

The literature study was carried out to obtain data on the biodiversity campus, the potential for biodiversity at the Dramaga Campus of IPB, and the distribution of wildlife and plant habitats to adjust the board's location to the habitat obtained from articles, books, and research journals. The list of interpretation boards is obtained from the report of the Himakova Environmental Social Bureau.

2.2. Data analysis method

Methods of data analysis using descriptive quantitative methods. Descriptive research methods with a quantitative approach describe the relationship between variables and media effectiveness using statistical analysis (frequency, percentage) [12]. The effectiveness of interpretation media is assessed
from field observations, literature studies, and assessments from interviews with respondents. The media is declared effective if it fulfills the assessment based on field observations and the results of questionnaires to respondents.

Assessment of interpretation boards' effectiveness uses [13] elements and the scoring criteria by [14]. These elements include (a) the material presented, with systematic criteria, the suitability of themes and suitability of illustrations (b) media design, with media design criteria using multiple colors, using contrasting colors in titles, attractive titles, using illustrations, short sentences and simple, using capital and small letters, the contrast between the writing and the background color, the large size of the writing, and the height of the board material, (c) the layout consisting of the interpretation board location and position, the number of board locations seen, habitat suitability, visitor path circulation, unobstructed by other objects and protected from sun and rain.

The assessment data for each criterion obtained based on field observations and interviews are then presented. Furthermore, the percentage of assessments of each criterion is combined and then classified into three categories: (1) effective (fulfil 10-14 criterions/≥ 67%), (2) not yet effective (fulfil 5-9 criterions/67% > %n > 33%), (3) ineffective (fulfil 1-4 criterions/≤ 33%). The percentage results obtained based on field observations and interviews were compared with the literature. The final results of assessing the effectiveness of the media at the Dramaga Campus of IPB were obtained.

3. Result and Discussion
Effectiveness can be interpreted as the relationship between output and objectives. The more significant the output contribution to the goal limits, the more effective the program is organized [15]. The effectiveness of campus biodiversity interpretation media is based on layout, media design, and material presented on-campus biodiversity [13].

3.1. Interpretation Media Layout
Installation of interpretation boards is carried out based on on-site interpretation techniques, where the installation is based on where animals and plants are found [16]. The board installation location's effectiveness can be assessed based on the percentage of planks seen and visitor path circulation [13]. The number of interpretation boards located in the IPB Dramaga campus area is 44 boards spread across 13 locations (Figure 1). The Faculty of Forestry (Fahutan) is the location with the highest number of boards, namely nine boards (21%). The location has diverse vegetation with some endemic trees and many species of animals. Meanwhile, the lowest number of board installations was in the FPIK-Fapet-FKH area. The installation of boards in the area is considered not following the interpreted wildlife habitat [17].

![Figure 1. Location of interpretation board distribution](image-url)
The study shows that the student group has seen interpretation boards more than 67%. This indicates that the location of the board is suitable for student respondents. The lecturer respondents have seen all of the interpretation boards but not exceed 67%. This indicates that the location of the interpretation boards is not yet effective for the lecturer group. The general public shows different results from students and lecturers. The general public has seen only 45% of the boards. The general public sees only the interpretation boards located in the front area of the Dramaga Campus of IPB. This shows that the board location is not effective for the general population.

In addition to the number of interpretation boards installed, the criteria for suitability of installation locations on pedestrian paths will increase plank visibility [14]. The interview result shows that interpretation boards are seen more on pedestrian paths than interpretation boards that are not located on pedestrian paths. The result shows that 73.33% of the planks have been placed following the pedestrian path. The respondents' interviews show that 61% of all respondents explained that the boards' location followed the pedestrian path circulation. Most of the lecturers and student respondents assessed 67%. However, 50% of community respondents considered that the boards' location did not follow the pedestrian path circulation. This is because the placement is not following the pedestrian path. However, two boards have their backs to the pedestrian lane, which reduces visibility. Some of the boards are not placed following pedestrian paths since the paths are mostly traversed by motorized vehicles, and there are no sidewalks at the location. Also, the interpretation boards are preferred for pedestrians due to the boards' size (60x40cm2). This is confirmed by the percentage of boards seen by respondents.

The board's position is a crucial aspect in assessing the media's effectiveness. The interview results showed that most (80%) of the boards had met the criteria or positioned correctly. However, 9% of the board is blocked by other objects. According to [13], the interpretation board's placement must consider the aspect of visitor convenience, meaning that the installation of the interpretation board is not blocked or obstructed by other objects and is protected from sunlight or rain so that the color on the interpretation board does not fade. All interpretation boards on the Dramaga IPB Campus are not equipped with protective roofs/shelters to be exposed to rain and sunshine. There are two boards under the building corridor, so they are protected from rain and sunshine.

Based on interviews with respondents, most respondents considered that the interpretation board was in a good position. 72% were not obstructed by other objects such as trash cans, trees, etc. As many as 59% considered, the board's protection did not need to use a protective roof/shelter.

3.2. Interpretation media design
Design is one of the essential parts of designing interpretation media [13]. According to [9], [18], attractive designs will attract interest in reading interpretation boards. Six criteria can be used in assessing the effectiveness of design: the use of many colors, the use of illustrations, short and simple sentences, the background color that contrasts with the writing, the size of the extensive writing, and the height of the boards [18]. The assessment result indicates that most of the interpreted boards (≥82%) were already using a combination of many colors, using small and large letters, having a large writing size, using illustrations, and having sufficient height. However, approximately 48-54% did not meet the criteria for simple sentences and the contrast between writing and background color.

The first criterion affecting effectiveness based on design elements is to use multiple colors in the media. The study shows that all interpretation boards use a colorful design. The background color used on all boards is white; the content writes in dark green. The quotes board uses a white background with the writing using light green. The wildlife distribution map uses a white background with topography using various kinds of colors.

The second criterion is a contrasting color on the interpretation board title. 50% of boards use a contrasting color on the board title. The title on the interpretation board uses black with white as the background color. The old design board uses black in the title writing and purple on the title's background.

The next criteria relate to the material's design and content, namely short and straightforward sentences, the contrast between writing and color, and large text size. An interpretation board should provide information briefly but can be understood by visitors. The word length contained in the
material is 225-300 words [18]. However, an interpretation board's size with an average board size (6x4m) can only consist of 75 words [19]. The observation result shows that 48% of boards' text is less than 75 words with a board size of 60x40 cm², classified as having short and simple sentences. The sentences have used a combination of lowercase and uppercase letters. The title's average size on the interpretation board is 2cm, with the material's content size of 1.3 cm. The board's writing can be read from a viewing distance of 0.15m to 1.5m - 2m or even more than 2m. The size of the material's title and content is appropriate because the average size of the material's title and content is equal to or more than 2 cm and 0.6 cm [18].

Concerning board height, interpretation boards are categorized as too high. The maximum height for an interpretation medium is 2.15 m [13]. However, the average height of young adults and Indonesians is 164 cm [20]. The board's measurement shows that the board's average height is 156 cm, indicating that the interpretation boards' height has met the height criteria. However, some boards are still positioned in high places, making it not easy to read. Overall, ≥67% of respondents think that the board height is appropriate, which indicates that the interpretation board has been effectively measured from this aspect.

Related illustration, ≥67% of respondents agree that the illustration is appropriate, indicating that the interpretation board has been effectively measured from the aspect. Respondents considered the illustrations to be engaging because it has original photos of wildlife and plants. The boards' colors are considered less attractive since the colors do not contrast with the surrounding scenery, reducing respondents' interest in reading. Also, respondents thought that the writing's content and size were too dense to read and too small to read. The score given by respondents is 50%, or it is in the ineffective category. This assessment is strengthened by the percentage of the number of boards read. The data shows that most read boards are quotes boards (23%) and spread maps (28%). 30% of respondents prefer short and simple sentences. The writing color is also considered ineffective (less than 67%) because it does not contrast between the writing color and the background color.

3.3. Information presented
The information conveyed at the Dramaga IPB biodiversity campus is flora and fauna found on the Dramaga IPB Campus and the importance of conservation for the environment. The contents consisted of (1) a map of the distribution of mammals, aves, herpetofauna, and butterfly classes; (2) a tree nameplate; (3) an animal species board; and (4) quotes about conservation. This interpretation board's theme is the biodiversity campus, which introduces the Dramaga IPB campus as a biodiversity campus with various flora and fauna to the entire IPB community and the broader community [16]. There are three types of boards found (Table 1).

| No. | Board Type      | Board content                                                                 | Percentage |
|-----|----------------|-------------------------------------------------------------------------------|------------|
| 1.  | Interpretation board | Describe taxa, characteristics, distribution within IPB and outside IPB for wild animals and plants, and the benefits of plants | 80%        |
| 2.  | Bulletin board | Distribution map of mammals, birds, herpetofauna, and butterflies in the Dramaga IPB campus | 9%         |
| 3.  | Regulatory board | Provide information related to the purpose of the biodiversity campus (code of ethics) and quotes so that readers can comply with and care about biodiversity on the Dramaga IPB campus | 11%        |

Interpretation boards provide education to visitors regarding animals and plants found at the Dramaga IPB Campus. A notice board provides information regarding wildlife distribution at the Dramaga IPB Campus. Lastly, a regulatory board contains an invitation and concern for campus biodiversity. The wildlife species interpreted on the board are the species that are often found within the campus. This wildlife is coconut squirrels, squirrel kekes, cucak kutiung, viper snakes. Only a few endemic animals are interpreted on the board, namely the Javanese Cinemen (Orthotomus sepium)
and *Papilio karna*. The plant species interpreted are plants used as street names in the Dramaga IPB campus, and 50% of the interpreted plants are rare plants included in 200 rare Indonesian plants [21]. Unfortunately, the scarcity status is not written in the board material.

The respondent's assessment of the material's content shows that the lowest assessment is of the material content's systematics. The systematic content of material on an interpretation board should not have more than five discussion topics or main ideas [18]. Almost all the material contents do not exceed five main ideas. There are six boards with more than five main ideas (four plant interpretation boards and two herpetofauna interpretation boards). However, the systematic criteria did not meet the respondents' preference. This is because the respondent dislikes writing text in paragraph form. Overall, the material's content assessment results indicate that respondents' knowledge level is the various species of wildlife and plants.

3.4. Assessment of Media Effectiveness Interpretation Campus Biodiversity

The criteria to assess the effectiveness of interpretation boards are using [13] elements and [14] criteria. Table 2 is an assessment of effectiveness result.

| No. | Category            | Weight          | Number of criteria | Field Observation Assessment                                                                 | Respondents Assessment Results                                                                 |
|-----|---------------------|-----------------|--------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 1.  | Effective           | %n ≥ 67%        | 10                 | • Path circulation • Suitability of placement with wildlife/plant habitats • Not obstructed by other objects • Protected from the sun • Uses many colors • Using illustrations • Large text size • Appropriate board height • Theme compatibility • Suitability of illustrations | • Not obstructed by other objects • Use illustrations • Suitable board height • Theme compatibility • Suitability of illustrations |
| 2.  | Not yet effective   | 67% > %n > 33%  | 3                  | • Short and simple sentences • The contrast between text and background color • Systematics     | • Percentage of boards viewed • Path circulation • Uses many colors • Short and simple sentences • Large print size • The contrast between text and background color |
| 3.  | Ineffective         | %n ≤ 33%        | -                  | -                                                                                             | -                                                                                                |

Table 2 shows criteria with a different value between the field observations results and the respondents' assessment. These criteria are the percentage of boards seen, the suitability of placement with habitat, lane circulation, board protection, using lots of colors, and large writing sizes. Different ratings were found for different groups of respondents. The assessment by students is higher than the assessment by community and lecturers. The criterion is the percentage of boards seen. For the students, boards can be categorized as effective because they have exceeded 67%. While the general public, only seen 45% have seen the interpretation boards at Dramaga IPB Campus. Activities and daily activities on campus give IPB students have more time to explore objects on campus. This is following the results of [22] study, which found that visitors who have repeatedly come to a natural tourism area will pay more attention to the interpretation boards found in the area. Based on this, the
criteria are considered ineffective because the board's location should be accessible to all visitors who come [23]. A similar thing is also found in the route circulation criteria. The overall respondent's assessment is low. Only 50% of the community thinks the location follows the route circulation, which causes the community can see only a few interpretation boards. This result reinforces [24] statement, stating that boards' placement on pedestrian paths facilitates the boards' visibility.

The criterion for board protection has a different rating between field observation and the interview result. Respondents advised that the boards only need to be given more substantial materials and more intensive care to maintain their condition. The result similar with [19] statement that monitoring of the board is essential so that the condition of the board is maintained.

Effectiveness can be said to be successful if the output is equal to or greater than the achievement of goals [15]. This is because interpretation media can be effective if it meets the same assessment between field observation, literature, and respondents' assessment [13]. The study result indicates that the criteria of boards seen, track circulation, lots of colors, and large text sizes are considered ineffective because they do not match the respondent's assessment. Moreover, it can attract visitors' attention. To improve all the ineffective criteria, it is necessary to have a location map showing the installed interpretation boards' location. This is so that the boards' percentage to be seen is more significant since the community could know where the boards are located. Not only can students access all the locations of interpretation boards, but lecturers and the community can access the location. Another recommendation is to move the wildlife distribution map location to more accessible areas to the community, such as the rector's park and the GWW. The result is reinforced [19] statement that it is crucial to put maps at the entrance to an area so the visitor could have more knowledge about the site condition, including the availability of interpretation boards. The boards with the lowest percentage of views need to be moved to the same location but positioned on a more traversed path by pedestrians and have sidewalks. The color used must use a contrasting color according to the respondent's assessment. The criteria for using multiple colors and the contrast between the writing and the background color can be improved. The color notes used are contrasting colors with the background around the interpretation board. The board's size needs to be enlarged so that the writing size can be enlarged and can change the material's content into discussion points so that the content of the material becomes systematic.

4. Conclusion
The study result indicates that signs designs, content and position are important in enhancing its effectiveness to deliver an interpretive message. The Interpretation Board for Dramaga Campus of IPB as an information center for tropical biodiversity is considered ineffective. This is because only 50% of the effectiveness criteria have been met. The criteria that are considered effective are the suitability of the placement with the wildlife/plant habitat, not being obstructed by other objects, being protected from sunlight and rain, using illustrations, appropriate board height, and themes, and suitability of illustrations. Eight areas are considered effective, and five areas that are considered ineffective. These areas are GWW, FPIK Fapet-Pond Enclosure Gate, Lecturer Housing, Al-Hurriyah - Old Sports Hall, and FPIK-Fapet-FKH.

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