



# Validation of Morphometric Teaching Materials with South Sumatera Local Fish Content

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## Abstract

**Background:** In the local context of South Sumatra, it is known that freshwater fish occupy important sociological and economic aspects. Placement of materials such as examples of belida fish, snakehead fish, betok fish and local species of fish from South Sumatra into the Morphometry course is something that will support the understanding of morphometry. The existence of this material will also meet the demands of the curriculum with contextual material. This study aims to explain the results of construct and material validation on the product of Morphometry subject teaching materials based on local Sumatran content. This research was conducted in the Biology Education Study Program. **Methods:** This type of research is descriptive qualitative using expert validation sheets. A validation sheet is given and an expert is assessed. Experts who provide assessments include material experts and constructivists. Validation includes aspects of the construct and material on the product of teaching materials. **Results:** The validation results show that the results of the construct expert validation obtained 91.42% results and were declared valid/no need to be revised and the material expert validation results obtained 97.14% results and were declared valid/no need to be revised. **Conclusions:** Based on these results, it can be concluded that the product of teaching materials is declared valid by construct and material experts so that the product can be used for the next process. These results indicate that the teaching materials are in accordance with learning outcomes and can support the learning process of Morphometry Subjects.

**Keywords:** keyword 1; keyword 2; keyword 3 (List three to ten pertinent keywords specific to the article yet reasonably common within the subject discipline.)

## Introduction

Learning is a way to change individual behavior, in personal life, society, and nature (Nata, 2016). The learning process is the result of curriculum implementation and the curriculum itself has one component, namely the use of learning resources that can achieve competency mastery (Masykur, 2019). Learning resources such as teaching materials are one component of the learning process (Dwijayani, 2019). In the learning process in higher education, learning resources in the form of teaching materials are needed by students to guide students in the learning process.

Locally charged teaching materials have become a major issue in the midst of strong globalization and greatly affect the attitudes and behavior of the Indonesian people (Ma'ruf and Herlina, 2016). One of the courses that have the potential to develop local content-based teaching materials is the Morphometry Course. Contextual material content in the Morphometry Course can be appointed and has a strategic position to develop the professionalism of the prospective Biology teacher. This is because the Morphometry course is related to the content of biological science which studies the relationship of



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shape, size of organisms, and morphometric characters used to determine the natural growth pattern of a species in a certain area or area. (Mayr & Ashlock, 1991) stated that in the study of morphometry, one of the factors that shape the morphological character of animals is the variation of geographic habitat. Several studies indicate that a morphometric variation of a population is closely related to the habitat of that population in a particular geographic habitat. Research conducted by (Sodikin, 2015) revealed that snakehead fish (*Channa striata*) found in the Musi River, Ogan River, and Kelekar River in South Sumatra Province have morphometric variations. In (Meilina et al., 2019) that there are variations in morphological characters such as the length and weight of the snakehead fish (*Channa striata* B.) related to the habitat condition of the fish, namely in two waters of Musi Banyuasin Regency, South Sumatra.

Based on the description above, it shows that the local content of South Sumatra has the potential to be integrated into Morphometry teaching materials. This is because the Biology Education Study Program, FKIP Sriwijaya University, does not yet have teaching materials containing local content that were made specifically to guide students to take the lecture. Based on research conducted by (Madang & Maria, 2006) that the results of the analysis of student needs on the availability of morphometric teaching materials showed that 92.9% of students stated that it was necessary to make special teaching materials for morphometric courses because morphometric teaching materials so far have only been part of the chapter in a book and an article that has not been fully made into a form of Morphometry teaching material. The results of the needs analysis carried out also showed that 64.3% of students stated that it was necessary to develop morphometry teaching materials containing local content in South Sumatra because in the context of the example there was still no local content.

Teaching materials that contain local content, of course, have advantages. (Rizky, 2020) revealed that locally-based teaching materials help students learn topics that are close to life and their environment so that by studying locally-based teaching materials, students learn real examples that are close to building knowledge of the material being studied. Masihu & Augustyn (2021) also revealed that locally charged teaching materials help students learn the material according to their characteristics and the conditions in which they study. This is also supported by research conducted by (Melati et al., 2020) that by developing locally-based teaching materials, it can bring students closer to their natural surroundings. Therefore, based on these things, in the learning process itself, teaching materials are needed that can support the learning process, especially contextual learning.

The teaching materials made need to be checked for feasibility, suitability and correctness from certain aspects. These aspects include the material aspect and the construct aspect of teaching materials. This is obtained from the validation process. According to (Suharsimi, 2015) that whether or not something is used in a study needs to go through a validation process. (Afrahamiryano & Ariani, 2017) revealed that teaching materials need to meet valid aspects related to clear and precise material substances that can motivate students. (Santiyadiputra, 2017) also reveal that the construct of a teaching material also needs to be validated including its content, presentation method, and physical form. Based on this, local content-based teaching materials that are developed need to be validated with the aim of knowing the feasibility and suitability of teaching materials from the aspect of construction and material so that it is hoped that information related to the validity of the material and construct aspects of teaching materials can be obtained so that it is expected to improve the quality of the teaching materials themselves.

## Methods

### Research Design

This research was conducted at the Biology Education Study Program, Sriwijaya University in the odd semester of the 2020/2021 Academic Year. The type of research

used is descriptive qualitative research. The instrument used is an expert validation sheet. The assessment was carried out by material experts and constructivists. In the aspects of the material assessed, among others, the substance of the material, the suitability of the learning outcomes of the subject, the truth of concepts and principles, the examples presented, and the teaching materials presented can support, facilitate understanding and motivate students in the learning process. In the construct aspect, the aspects of content presentation, selected design, text, images, language, and physical form of teaching materials are assessed.

**Data Analysis**

Validation data were analyzed by calculating the percentage between the results of the validator's assessment and the aspects being assessed. The assessment is carried out using a rating scale of one to five on each question (Riduwan, 2015). Determination of the conclusions that have been reached based on the percentage assessment criteria are presented in Table 1 (Sukmadinana, 2007).

**Table 1.** Percentage Data Assessment Criteria for Product Validation

No	Score (%)	Conclusion and Follow Up
1	80-100	Valid/not revised
2	65-80	Sufficiently valid/revised (re-validation)
3	≤ 65	Invalid/revised (reevaluation)

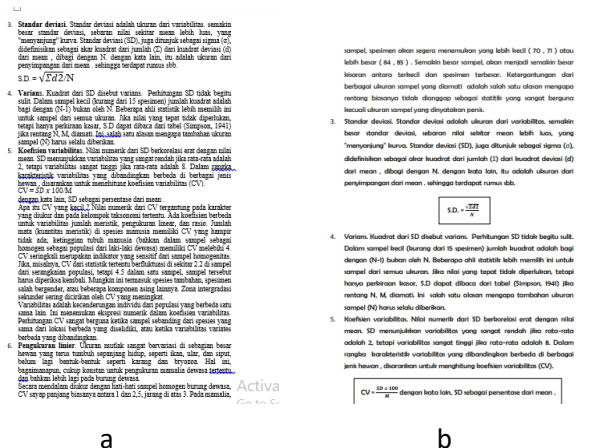
**Result**

Product development of teaching materials. If it needs to be corrected, a revision will be carried out so that in the end a valid result is obtained. Table 2 is a recapitulation of the results of the validation of the feasibility of the product in the aspect of constructs and materials.

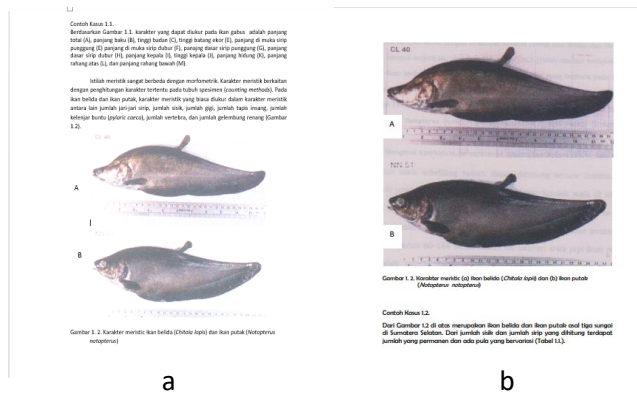
**Table 2.** Percentage of Morphometric Teaching Material Validation

No	Aspect	Percentage (%)
1	Construct	91.42
2	Material	97.14

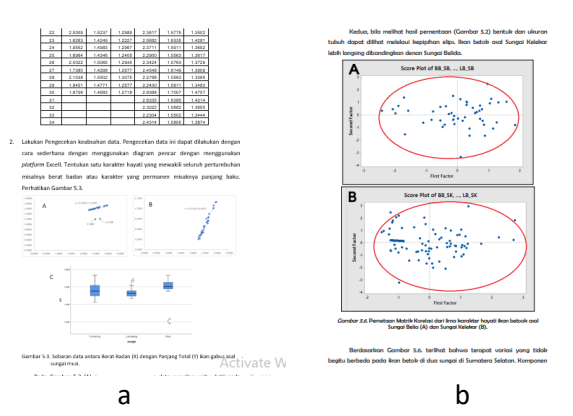
The material validator provides suggestions in the comments column as follows, namely it is necessary to deepen the linkage of material between chapters and each chapter begins with an introduction first. The construct validator provides suggestions, including mathematical equations written with an equation editor, and mathematical equations do not need to be numbered, and images and graphics need to be fixed in resolution.



**Figure 1.** Writing Mathematical Equations (a) Before Revision, (b) After Revision

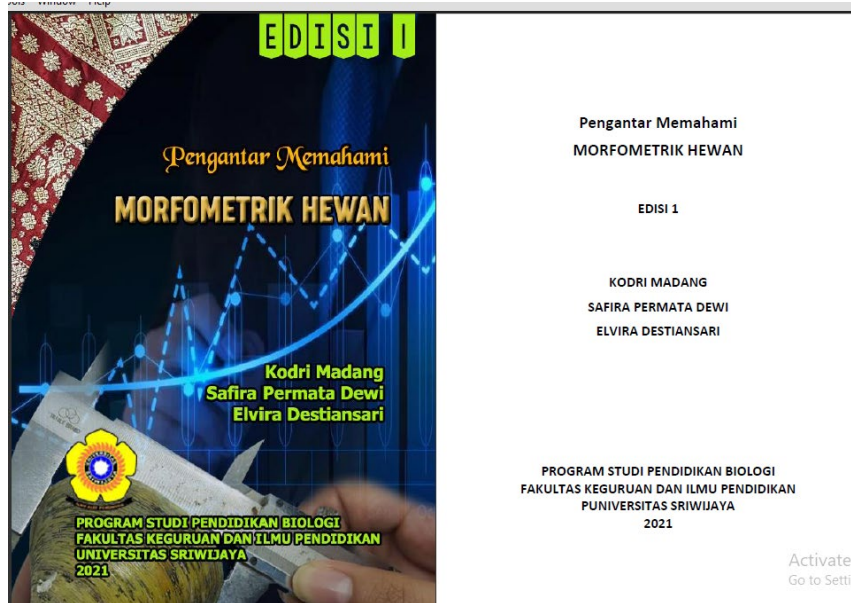


**Figure 2.** Image resolution improvement (a) Before Revision, (b) After Revision



**Figure 3.** Graphic improvement (a) Before Revision, (b) After Revision

The following is a morphometry teaching material that shows the initial appearance, contents per chapter and a bibliography. Illustration of teaching materials containing local fish content from South Sumatra are presented as follows:



**Figure 4.** Display of Morphometry Course Teaching Materials

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**BAB 1**  
**PENDAHULUAN**

**1.1. Pengantar Umum**

Pada Bab ini dijelaskan hal-hal mengenai terminologi dan batasan, ruang lingkup, dan pentingnya metode kuantitatif dalam morfometri. Untuk itu sebelum mempelajari Bab 1 ini, mahasiswa diharapkan dapat:

1. Menjelaskan makna morfometri dan mereti
2. Menentukan batasan dan ruang lingkup pekerjaan morfometri
3. Menjelaskan pentingnya metode kuantitatif dalam pekerjaan morfometri.

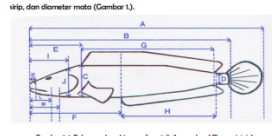
Selanjutnya, untuk dapat menguasai materi yang ada dalam bahan ajar ini sebaiknya mahasiswa membuat ringkasan sendiri, kemudian menyempurnakan apa yang telah dipelajari dengan membuat skripsi di internet dengan mencari hal-hal baru mengenai materi yang sedang dipelajari.

**1.2. Terminologi**

Ada dua istilah yang umum digunakan dalam kegiatan berukur dan ukuran tubuh suatu spesimen, yaitu morfometri dan mereti. Secara harfiah morfometri terdiri dua kata yaitu *morf* dan *metri*. Kata *Morfometri* ini sebenarnya berasal bahasa Yunani *morphe* yang berarti bentuk, dan *metri* yang berarti pengukuran. Dalam pengertian yang luas morfometri dapat mengacu pada analisis kuantitatif dari struktur suatu spesimen, yang didasari konsep yang mencakup ukuran dan bentuk.

Misalkan kita mengambil spesimen ikan gabus (*Channa striata*) dari induk sungai yang ada di Sumatera Selatan, yaitu Sungai Mui dan Sungai Ogan. Dalam hal-hal teknologi ini, morfometri adalah ukuran bagian-bagian tertentu dari struktur tubuh ikan (*measuring method*) yang berupa

jarah antara satu bagian tubuh ke bagian tubuh yang lain. Pada tubuh ikan, karakter morfometri yang sering digunakan untuk diukur antara lain panjang total, panjang badan, panjang cagak, tinggi dan lebar badan, tinggi dan panjang sirip, dan diameter mata (Gambar 1).



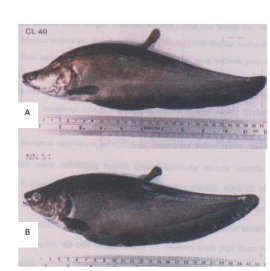
Gambar 1. Beberapa karakter morfometri ikan gabus (*Channa striata*)

Cantah Nona 11.

Berdasarkan Gambar 11, karakter yang dapat diukur pada ikan gabus adalah panjang total (A), panjang badan (B), tinggi badan (C), tinggi badan ekor (E), panjang di muka sirip punggung (G) panjang di muka sirip dubur (F), panjang dasar sirip punggung (G), panjang dasar sirip dubur (H), panjang kepala (I), tinggi kepala (I), panjang hidung (K), panjang rahang atas (L), dan panjang rahang bawah (M).

Mereti mereti sangat berbeda dengan morfometri, karakter mereti berkaitan dengan pengukuran karakter tertentu pada tubuh spesimen (*counting method*). Pada ikan belida dan ikan putak, karakter mereti yang biasa diukur dalam karakter mereti antara lain jumlah jari-jari sirip, jumlah sisik, jumlah sirip, jumlah tulang, jumlah belulang buntut (*epineurium*), jumlah vertebrae, dan jumlah gelembung renang (Gambar 12).

Figure 6. Chapter 1 Introduction



Gambar 1.1. Karakter mereti: (a) Ikan belida (*Channa striata*) dan (b) Ikan putak (*Mystus nigricaudatus*)

Cantah Nona 12.

Dari Gambar 12 di atas menunjukkan ikan belida dan ikan putak asal Hutan Sungai di Sumatera Selatan. Dari jumlah sisik dan jumlah sirip yang dihitung terdapat jumlah yang persamaan dan ada juga yang bervariasi (Tabel 13).

Tabel 1.1. Kuantitas jumlah sisik dan sirip ikan belida dan ikan putak asal perairan Sumatera Selatan

NO	Karakter Mereti	Ikan Belida ( <i>Channa striata</i> )			Ikan Putak ( <i>Mystus nigricaudatus</i> )		
		Sungai belukur Lemotong	Sungai Sunur	Sungai belukur Lemotong	Sungai Lemotong	Sungai Sunur	
1	a. Dorsal	10	10	8-10	7-9	7-9	8
	b. Anal	10-12a	9b-12b	11b-13b	10-12b	14-10b	11-10b
	c. Kaudal	12-15	12-15	14-16	11-15	11-15	12-14
	d. pectoral	15	15	15-16	15-15	15-15	15
2	Jumlah sisik						
	a. Dorsal linea lateral	20-24	20-27	23-28	20-27	18-26	19-27
	b. Obsolet linea lateral	21-41	21-41	21-41	21-32	21-34	21-41
	c. Clavico sirip punggung	99-113	94-118	94-125	96-125	87-147	72-143
d. Pipi	13-15	13	14-15	13-16	13-16	13	

(Mokong, 1999)

Figure 7. Materials in Chapter 1

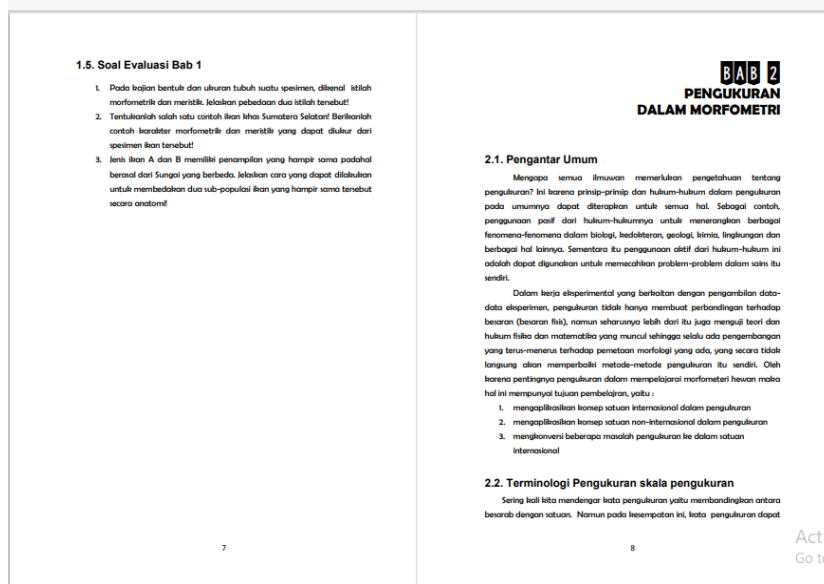


Figure 8. Chapter 2 Measurements in Morphometry

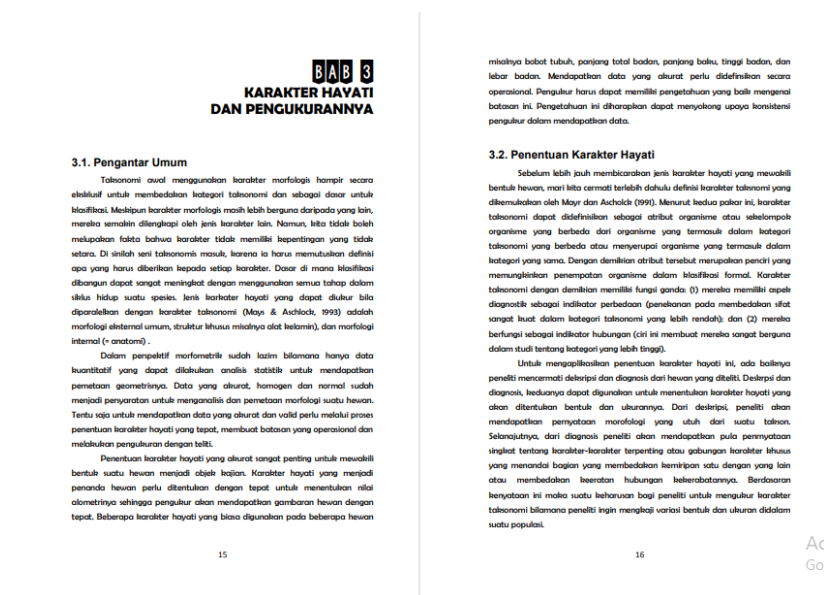


Figure 9. Chapter 3 Characters and Their Measurements

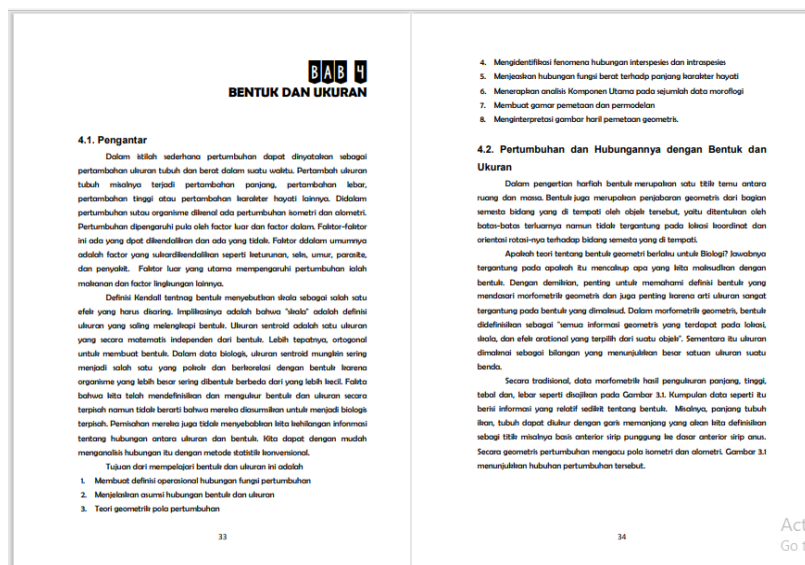


Figure 10. Chapter 4 Shapes and Sizes

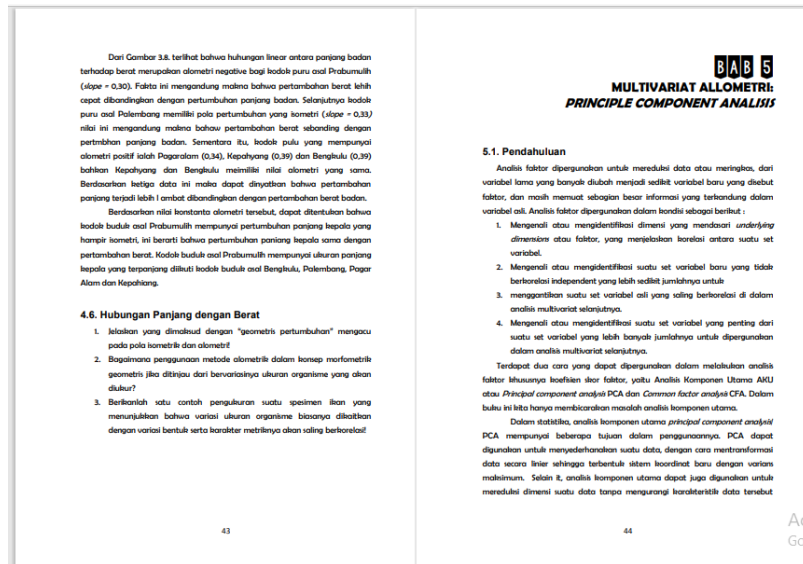


Figure 11. Chapter 5 Allometric Multivariate: Principal Component Analysis

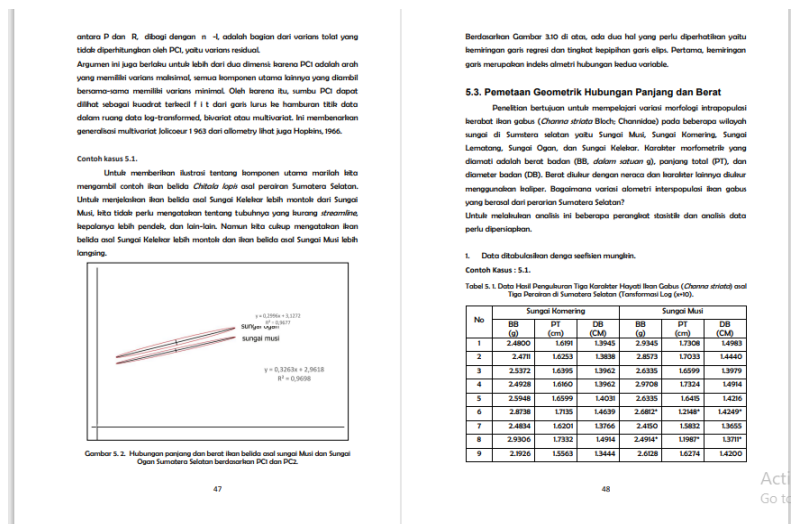


Figure 12. Material in Chapter 5

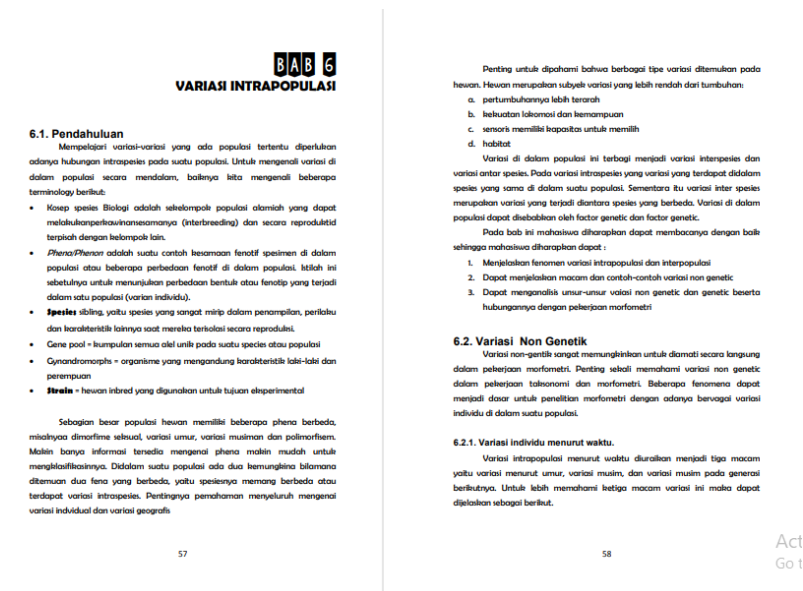


Figure 13. Chapter 6 Intrapopulation Variations

Makaromah, E., Madang, K. & Santoso, L.M. (2016). Morfologi Dan Variasi Interspesies Ikan Glodok (*Periophthalmus Gracilis* Dan *Periophthalmus Variabilis*) Di Wilayah Perairan Makarti Jaya Dan Sungang: Dan Sumbangnya Pada Pembelajaran Biologi Sma. *Prosiding Seminar Nasional Pendidikan Tanggal 2 Juni 2016, FKIP Universitas Muhammadiyah Palembang*

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Perada, A. P., Solihin, D. D., Affandi, R. (2021). Karakteristik genetik ikan belida *Channa Ijota* (Bleeker, 1851) asal Lampung dan Kalimantan berdasarkan gen COI. *Jurnal Biologi Indonesia* 21(1): 49-60

Putri, R.A., R. Elyza & Yusufani (2015). Karakteristik Morfometrik dan Meristik Ikan Laut Deras (*Osteop. Periophthalmus Bleeker*, 1846) di Sungai Tapung dan Sungai Sia. *JOM FMIPA*, 2(1): 57-66.

Selvianna, E., Affandi, R. & Kamal, M.M. (2020). Aspek Reproduksi Ikan Gabus (*Channa striata*) di Rawa Banjiran Aliran Sungai Sebangun, Palangkaraya. *Jurnal Ilmu Pertanian Indonesia (JIPI)*, 25(1), 10. |Biodikin, M. (2007). *Morfometri Ikan Gabus (Channa striata)* di perairan Sumatera Selatan. Skripsi: FKIP Uneri.

Sumarti, Madang, K., LM Santoso. (2018). Variasi Alometrik Ikan Tambakan (*Helosoma Temminckii* Cv) Asal Tiga Sungai Di Sumatera Selatan Dan Sumbangnya Pada Pembelajaran Biologi Sma. *Skripsi*. Fakultas Keguruan Dan Ilmu Pendidikan Universitas Sriwijaya.

Tzeng, T.D., Chiu, C.S., Yeh, S.Y. (2000). Morphometric Variation in Red-spot Prawn (*Metapenaeus barbatus*) in Different Geographic Waters of Taiwan. *Institute of Oceanography, National Taiwan University, Taipei 106, Taiwan ROC. Journal Fisheries Research* 53 (2001) 211-217

Wulandary, S., Madang, K. (2016). Variasi Alometri Ikan Sepat (*Trichogaster Pectoralis*) Asal Sungai Musi Dan Sungai Komering Serta Sumbangnya Pada Pembelajaran SMA. *Skripsi*. Fakultas Keguruan dan Ilmu Pendidikan Universitas Sriwijaya.

Zelditch, M.L., Swiderski, D.L., & Sheets H.D. (2012). *Geometrik Morphometric for Biologist*. San Diego: Academic Press.



**Figure 14.** Bibliography and Author Identity

**Discussion**

Based on Table 1, it is known that the validation results are 91.42% from the construct aspect. This shows that the design, both in terms of the accuracy of the background selection, the accuracy of the layout selection, the proportion of colors and symbols, the suitability of the layout, then related to the text font and quality of the display, is valid and does not need to be revised significantly. This is also expressed by (Ilyasa & Dwiningsih, 2020) that the construct aspect is closely related to presentation. (Syahrul, 2019) also revealed aspects of presentation as an example of which letters and fonts in the text were also considered because they involved the meaning conveyed and minimized misunderstandings about the content presented. In addition, according to (Sukirman, 2020), the correct use of terms, words, and punctuation marks also needs to be corrected because they are related to the meaning of writing.

In this study in the constructs aspect, suggestions were also obtained from the validator. The advice given by the validator is only related to writing mathematical equations which should use an equation editor and mathematical equations do not need to be numbered. In addition, some images and graphics need to be increased in resolution. Based on the validator's suggestion, a revision was made regarding this matter. Revisions related to this are presented in Figure 1, Figure 2, and Figure 3. In Figure 1 (b) improvements have been made regarding writing mathematical equations using the equation editor, Then in Figure 2 (b) and Figure 3 (b) related improvements have been made pictures and graphics. (Suswina, 2016) add that teaching materials equipped with pictures and illustrations will be very good because they will help the reader's understanding.

Based on Table 2 also shows that the material aspect is 97.14% and is categorized as valid. The results of this validation indicate that from the aspect of the content of the morphometry course teaching materials based on local content in South Sumatra, it is in accordance with learning outcomes and has sufficiently supported the learning process. (Dzikro & Dwiningsih, 2021) revealed that validation related to the substance of the material needs to be done because it is to find out its relevance to existing learning materials. Therefore, the suitability of the substance of the material with existing learning materials and learning outcomes needs to be done.

The material in the morphometry course teaching materials is presented in a complete and systematic way. Completeness of teaching materials starting from the cover, foreword, table of contents, table of tables, list of pictures, chapters, bibliography and identity of the author. The completeness is generally presented in Figure 5. Then each



chapter has an introduction to the chapter, material, examples, case studies and evaluation per chapter. The examples presented are based on local South Sumatran content and one of them can be seen in Figure 7. (Tian, 2003) reveals that the coherence of the content of teaching materials is important to make learning easier and also guides students to get used to thinking coherently. Therefore, apart from being coherent, we also need examples that are close to the environment and illustrations that make it easier to understand

Based on the validation results, it indicates that the teaching materials made are feasible and good to use. In the end, it is also hoped that the teaching materials based on local content of South Sumatran fish can facilitate students to be actively involved in the learning process. This is expected to be in line with the research of (Nursela et al., 2021) also revealed that the presence of teaching materials helped in the learning process. In addition, According to (Pratita et al., 2021) that with the existence of teaching materials, they can support the student lecture process. Teaching materials are also expected to be used by students in lecturing activities independently or with assistance from the lecturers of the courses being taught. Therefore, it can be seen that with an assessment of the quality of this teaching material product, it shows that this teaching material product is feasible and good to use at a later stage.

### Conclusions

The validation of morphometry course teaching materials with local fish content from South Sumatra has been carried out by material experts and constructivists. Based on the results of expert validation, the results showed that the teaching materials from the aspect of constructs and materials were categorized as valid. Improvements according to the validator's suggestions and comments have been made to improve the quality of the teaching materials that have been made. Based on the results of this validation, it can be concluded that the teaching materials have a decent and good category and can be continued to the practicality test in order to determine the effectiveness of their use in the learning process.

### Declaration statement

The authors reported no potential conflict of interest.

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