

# Learning media development of the cheap skin-based model for medical faculty students at Tadulako University

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**Abstract:** A model is a learning media that is used instead of the real human body to increase students' knowledge and can also practice medical skills, which are impossible to apply to real patients. Learning using models is the first order in learning clinical skills before students proceed to the next stage, namely practicing with friends and the last one is going directly to the community. The purpose of this study was to design, create and analyze a skin model made from cheap raw materials like wood so that it can be used as a learning aid at the Faculty of Medicine, Tadulako University. This research applied a qualitative approach with the Research and Development method. The sampling technique as the informant was taken through purposive sampling. The informants consisted of a dermatologist and sex expert, a medical education expert, and a histology lecturer. Data was collected through in-depth interviews and observation. Data analysis was carried out by analyzing the opinions of the informants using questionnaires to help guide the interview. The cheap leather model shows a fairly realistic mannequin shape with colors that can distinguish each layer and can be used as a learning aid for students in the histology department. Learning media development of the cheap leather model shows a fairly realistic mannequin shape with colors that can distinguish each layer and can be used as a learning aid for students in the histology department.

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## 1. Introduction

A model is a three-dimensional form of a concept and belongs to the category of display objects (Rizalanda et al., 2019). Mannequins are learning media that are used as a substitute for the real human body to increase student knowledge (Fathunikmah & Rafida, 2018). It can also practice medical skills that are invasive and impossible to apply to real patients. The use of mannequins can be done by students to practice repeatedly without fear of making mistakes and also increase self-confidence to prepare students mentally before entering clinical education in hospitals (Demak et al., 2019).

Learning using models ranks first in the clinical skills learning system (Santoso, 2017). The next learning stage is the stage of practicing with friends, practicing with simulated patients, and the last one is the practice of implementing it in the community. The advantages of using the model are efficiency concerning time, place, and cost does not require complicated skills, and the ability to develop students' imaginations in understanding the concepts outlined in a learning process (Demak et al., 2019).

The use of the mannequin model at the Faculty of Medicine, Tadulako University is faced with the problem of a relatively expensive cost factor. The budget for procurement, repair, and maintenance of mannequin models to practice medical skills are very expensive. The expensive price of the mannequin model is because generally the mannequin

model is imported from abroad, so this is certainly an obstacle for universities that have a Medical Education Study Program (Demak et al., 2019). Mannequin models vary widely in type and shape, generally divided based on the body part to be studied, one of the most commonly used mannequin models in medical learning is the human skin organ model.

The skin is the heaviest single organ on the outside of our body, which usually makes up 15-20% of total body weight in adults, and has a surface area of 1,5-2 m<sup>2</sup> (Handayani, 2021). Besides being known as the cutaneous layer or integument (L. integument, layer), the skin consists of the epidermis, which is an epithelial layer derived from the ectoderm, and the dermis, a layer of connective tissue derived from the mesoderm (Lusi, 2017). Epidermal derivatives include hair, nails, sebaceous glands, and sweat glands. Beneath the dermis is the hypodermis (Greek hypo/ under, derma/ skin), or subcutaneous tissue, which is the loose connective tissue that may contain adipose tissue (Sumiyati et al., 2021).

Research on the Making and Validation of Leather Model Learning Media with cheap basic material prices has never been done before. This is important to do because medical learning needs to use modeling, and the problem that arises is that there are no learning media in the form of a skin model that can provide an overview of the skin structure. The purpose of this study was to develop and validate a leather model with low-cost materials so that it could help improve student understanding. In the future, it is hoped that the results of this development research can be utilized and applied by all medical institutions in Indonesia as a substitute for the human skin mannequin model.

## 2. Materials and Methods

This study uses the Research and Development method. This method is a research method used to produce products. The design of this research activity was carried out based on development research steps. This research will start from the stage of exploring potential and formulating problems, until the validation of stages I and II. The first stage is the potential search stage and problem formulation by collecting data and making product designs. The last stage is design validation by media experts which is carried out twice.

The sampling technique used was purposive sampling, which is a sampling technique for data sources with the consideration of experts related to the development of skin organ modeling media. The informants consisted of a skin and genital modeling expert, a medical education expert, and a histologist. Data was collected through in-depth interviews and observation. Data analysis was carried out by analyzing the opinions of the informants using questionnaires to assist the interview process.

## 3. Results

### A. Model Making Phase

The skin model carried out by researchers is carried out in the manufacturing stage based on observations of the histological structure of the skin, as well as referring to several references regarding skin anatomy (Murlistyarini et al., 2018). The manufacture is carried out, as close as possible to the structure of genuine leather so that it has the expected value and benefits. The first skin model was designed simply but did not show the accuracy of the shape and size but from the results of the manufacture and validation stage of the model. The steps in making mannequins at this stage are:

1. Designing the skin model is designed by showing examples of model drawings and explaining the parts that require special attention in the structure and layers of the skin (epidermis, dermis, and hypodermis)
2. Discuss the materials that will be used for the manufacture of the outer skeleton of the skin model without abandoning the rules of its anatomical and histological structure. The process is divided into:
  - a. Selection of quality teak wood as the main raw material for leather models

- b. Making the shape of the epidermal layer by cutting some wood and carving the papilla dermis structure and then making the outer skin motif using a pen.
- c. Designing the dermis and hypodermis layers using wood, which will later be combined with the epidermis layer.
- d. Make a design of existing structures in the dermis and epidermis layers following the rules of the anatomical structure and histology of the skin.
- e. Stages of the painting process on leather models that have gone through the process of engraving structures.
- f. Produce first phase leather model (before validation) made of wood (cheap)

**B. Model Validation Phase**

**First Phase Evaluation**

The first phase evaluation of the skin model that has been made involves 3 expert informants, namely a histology specialist (informant 1), an expert in medical education (informant 2), and a dermatologist (informant 3). First phase evaluation process through in-depth interview and observation. Then the results of this phase determined several weaknesses and suggestions for improvement (Table 1).

Based on the results of the validation for the shortcomings of the evaluation of stage I, improvements were made to some of these parts. Additional activities were carried out such as making structural details on the skin model attached and delaminating, which aims to complete information on the parts and functions of the skin structure. Next, give marks/numbers on the designated structure on the leather model, the goal is the same so that each part of the skin can be distinguished. The last step is coloring, which is done by adding thicker paint, due to the nature of the wood that absorbs liquid, the painting needs to be repeated so that the color resembles real leather.

**Table 1.** In-depth interview First Phase Evaluation

No	Informant	Comments about structure	Comment about color	suggestion
1	Informant 1	"...Later on, we can make a mapping on the pictures and make a numbering, so that when independent students can know and understand what this structure is..."	"...The color of this skin should be closer it should be..."	"Make details of the structure of the attached leather model and delaminate it so it doesn't get damaged quickly"
2	Informant 2	"...And don't forget the function is also attached and laminated so it doesn't get damaged quickly ..."	"...The color of these hair follicles should be bluish green ..."	"Marking the designated structure on the skin model"
3	Informant 3	"...This is good but there should be a signboard ..."	"...The color on this skin model is too white, not close to the actual skin color and the color of the hair follicles does not match ..."	"Improvements to the model both in structure and color"

**Second Phase Evaluation**

The model that has been improved in the first phase is then re-evaluated by the informants. The results of the second stage of the evaluation of the skin model can be seen in [Table 2](#). The results of the evaluation are the form of a mannequin which is quite realistic and is recommended to be used as a learning aid for students.

**Tabel 2.** In-depth interview Second Phase Evaluation

No	Informant	Comments about structure	Comment about color	Recommendation
1	Informant 1	"...It's all made of wood, isn't it? What makes the details meaningful is chiseled, this is good already ..."	"...The color is already close to the original ..."	"can be used for skin structure recognition"
2	Informant 2	"...It's all made of wood, isn't it? What makes the details meaningful is chiseled, this is good already ..."	"...The motifs are detailed and the colors are good ..."	"can be recommended for practicum"
3	Informant 3	"...This is already good plus the advantage of using wood as a basic material so that it can reduce production costs compared to other leather models."	"...The color on this skin model is quite representative ..."	"The shape and structure already describe the original, it can be used as a medium for this learning"

#### 4. Discussion

The development of cheap wood-based leather models is very important to do because students need real teaching media that can improve their understanding. Supported by facts in the field about the high price of leather models in stores and their availability which is not abundant, this is a challenge in itself. In the research on the development of this skin model, a questionnaire was used which was designed to assist informants in answering questions for media validation. At the point of questioning the shape of the leather model, the informant stated that for the leather model in terms of shape it was clear that it was following the statement [Sumiharsono & Hasanah, \(2018\)](#); [Sumiharsono & Hasanah, \(2017\)](#), that the learning media, in this case, the skin model must be visible. This becomes important in any research on the development of learning media to support understanding and attract students' attention to learning ([Maryuningsih et al., 2019](#); [Riyana, 2015](#)).

In terms of scale on the leather model, the informant stated that the thickness of each layer of the leather model corresponds to the thickness of the genuine leather with a magnification of 75x on the leather model (can be seen in [Figure 1](#)), following the theory ([Moniz et al., 2020](#)) which states that the layer of the epidermis has a thickness of 1.4 mm, the dermis layer is 2 mm and the hypodermis layer is 1.7 mm.



**Figure 1.** Model of cheap skin based made from wood on 75x magnification

In the development of this Skin Model learning media, there are questions about the paint used and its safety for the skin when touched. The informant stated that the skin model contains paint which when touched and inhaled is harmless and safe. This is because in the development of this leather model using paint with information on non-toxic and non-odorous paint, in addition to the finishing stage, the wood surface is coated with a layer that is also safe. The type of paint used to beautify and make the finishing of the furniture and is safe to touch and finish can affect the natural condition of the wood substrate and the coating of finishing materials on the wood surface. (Krisdianto et al., 2018).

At the evaluation stage, informants generally focus on parts of the structure of the skin model and also color. The structure of the skin model is one of the researchers' concerns to add information and sequence numbers according to the information provided in the information sheet. Basic learning in the world of medicine is to recognize and memorize parts of the anatomical structure of the human body, as well as the discussion of the skin. Students are required to understand and memorize all parts of the skin so that labeling and adding information to the leather model will greatly help students learn (Miranto & Wardani, 2019). The second point that is a concern for researchers is skin color because the color of the media will greatly affect students in learning. Bright colors will make students more interested in learning (Delani et al., 2017). On the other hand, the color also shows different parts of the genuine leather, so the staining is also important to improve. After being revised and re-validated by the informant, the results showed the advantages of the wood-based leather model that could reduce production costs or were cheap when compared to other leather models. Coupled with the motif of a very detailed leather model that supports the aesthetics of the leather model.

## 5. Conclusions

Skin model creation and validation gave good results. This skin model can give the impression of the anatomical and histological shape of the original skin so that the existence of the skin model can be used as a learning aid. Then, the use of cheap wood materials can reduce the production cost of the model compared to other leather models on the market, and give the impression of being sturdy and durable and the color of the structure and layers of the leather model is close to perfect.

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