

# LEARNING MATERIALS AND LEARNING METHODS IN MATERIALS FOR PRODUCT COURSE FOR BASIC PRODUCT DESIGN EDUCATION

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## ABSTRACT

Materials for Product courses are given in the first and second semesters which are part of basic education in the curriculum of product design courses, Faculty of Art and Design, Trisakti University. After taking the course, students are expected to have a competency to apply the knowledge in choosing and using the right materials in the products to be designed. Although the course leads to engineering materials knowledge, the learning materials and methods remain in the perspective of product design as the designation is for the students of the Product Design Program. This paper aims to discuss the right learning materials and learning methods delivered in Materials for Product to the students of Product Design Programs in order to achieve the goals. The conclusion of the discussion in this paper recommends that problem based-learning method is an appropriate learning method to be applied.

**Keywords:** Materials for Product course, material, learning methods, product design

## INTRODUCTION

In a product design, knowledge on materials is an important factor to be mastered by a product designer, thus also for students of Product Designs Programs. The Materials for Product course at Product Design Program of Trisakti university is given on basic education (first and second semester) with a weight of two credits each and supporting courses such as Dimensions of Space, Materials and Processes, Product Designs 1 – 5, Final Project, and other courses. Knowledge on materials becomes a foundation in determining the right material to be applied in a product. In addition to the knowledge, wisdom in thinking is also needed in choosing materials by considering the after-use effects for the environment.

Tracing back to the journey of Product Design Program of the Trisakti university, which was previously under the Faculty of Civil Engineering and Planning (FTSP), more or less has influenced the learning materials and methods of the Materials for Product course, which tend to focus on technical issues. The learning materials are mostly taken from engineering reference books that discuss material based on its physical and mechanical properties. For Product Design students who do not have this exact education background, this requires more effort to examine the material properties. In addition, the lecturer-centered learning methods where lecturers deliver more materials without giving students the opportunity to discuss, causes students to not fully understand the essence of the presented materials.

## LITERATURE REVIEWS

Materials are physical objects that consist of matter. The matter has a certain composition that defines the matter's performance and a shape that defines its physical appearance. Materials are also social entities that can provoke sensorial, associative and emotional user experiences. Experiential attributes that refer to the group of sensorial, associative and emotional material attributes can be difficult to grasp and articulate to others than yourself (Hasling, 2015: 60). Only considering physical properties could mean using materials in a product that are not socially suited for the product's purpose. Only considering experiential characteristics produces materials that do not follow functional requirements on for example production and durability. This antithesis creates a dichotomist approach to the materials field (Vannini, 2009: 3).

In a topic such as materials, it is easy to lose students' attention if the approach gets too technical. It is however also important to remember that we are not all supposed to approach materials similarly, but that our various understanding can complement each other's. This means that artistic design students are not required to acquire the same technical understanding of using materials as engineering design students; and that engineering design students are not expected to go as much in depth with experiential aspects and to work as much practice-based as artistic design students are. However, to work with product design and especially when working with sustainable design, it is necessary to approach design as holistically as possible and consider both technical and experiential aspects equally (Hasling, 2015: 239).

The materials teaching methodology has been developed to facilitate the appreciation and use of physical, experiential and sustainable material considerations and to challenge students' boundaries of what materials are and what they can be used for and to provide a structure to explore materials. The methodology is therefore also preparing students to challenge other actors' understanding of materials and thereby continuing to grow and strengthen their own practice (Hasling 2015: 239). The discipline of Materials knowledge is ideal for using case study teaching because of the wealth of practical, real life examples that can be used to contextualise the theoretical concepts. Educational research has shown case studies to be useful pedagogical tools. Grant (1997) outlines the benefits of using case studies as an interactive learning strategy, shifting the emphasis from teacher-centred to more student-centred activities.

## RESEARCH METHOD

This paper uses research methods of literature study and survey. Literature studies are taken from several research results related to the subject of Materials for Product course and learning methods in design education. The survey is conducted by asking lecturers in the Materials for Product course and students to fill out a questionnaire. The results of filling out the questionnaire were then outlined in broad terms what were the obstacles in the Materials for Product course. The questionnaire for students aims to find out their opinions about the learning materials and learning methods that have been given so far. There were around 50 students who filled out the questionnaire. Students who fill out the questionnaire are students participating in the Materials for Product course (1<sup>st</sup> semester) and students participating in the Material and Production Process course (2<sup>nd</sup> semester). The questionnaire filled out by the lecturer aims to find out the learning outcomes after attending the Materials for Product course. Survey through filling in questionnaires is one of efficient methods to

obtain information based on personal feelings and emotions (Shuman & Presser, 1996). In addition to fill out questionnaires, inputs regarding the learning materials and learning methods of this course were also obtained from lecturers of other subjects who needed the implementation of materials in product design namely Product Design 1-5 subjects to Final Projects.

## RESULT AND DISCUSSION

### Course Materials

Around the 1990s, the Materials for Product course was named Knowledge of Industrial Materials. Judging from its name, our perception will be directed to industrial material that is engineering. The learning materials presented are the types of materials used in the industrial world and emphasis on physical and mechanical properties. In discussions relating to material, it will be easy to lose the attention of students if the approach is too technical. But it is important to remember that the same learning materials approach cannot be applied to all students with different backgrounds, but various understandings can complement each other. This means that product design students are not required to obtain the same technical understanding of material use as well as engineering students; and vice versa (Hasling 2015: 239). The learning method delivered at that time is more of a textbook, where lecturers provide materials through notes on the board and students then copy it by taking notes in their respective books. The lecturers then gave an explanation with the lecturer-centered learning method so that in the end students only memorized the materials provided without a deep understanding of its implementation in product design.

Entering the 2000s, the Product Design Programs along with lecturers in the Materials for Product course saw the shifting paradigm regarding lectures on the course. Through curriculum evaluation, the results of the questionnaire filled in by lecturers and students concluded that in delivering learning materials, the approach was more directed to technical problems and lacking the direction of product design understanding. The approach with such methods causes the logic of thinking in students when choosing the right material on a product tends to be weak. This even happens when they are in the Final Project stage. For example, in a coffee maker design, the student has determined the material is an ABS (Acrylonitrile Butadiene Styrene) type of plastic, but when asked what is the reason behind the material selection, the student cannot provide an accurate explanation. In addition to the results of the questionnaire, input from lecturers who have a correlation with the Materials for Product course and input from stakeholders are also a matter of consideration regarding the right learning materials and methods.

As a follow up to the results of the curriculum evaluation, the learning materials presented in the courses of Materials for Product and Materials and Production Process emphasize on the logical understanding about the implementation of materials in product design, not only mechanical, physical, etc, but also visual (finished look). The discussion of the learning materials delivered is contextual and always associated with products that are close to their daily lives so that they have empirical experience in the character of the material used in the product. When a material is chosen for an artifact (such as a product), it should be based on its external performance, being physical and technical properties, as well as internal and contextual performance, being experiential characteristics (Vannini, 2009: 3). The learning materials is packaged and delivered in a visual form and occasionally delivered by playing films related to the material being discussed. This is one

application of the questionnaire results where students feel more understanding if the explanation of the material is equipped with visual and audio-visual images (films). The discussion of the appearance of a product is further linked also to the selection of colors, textures, and finished materials.

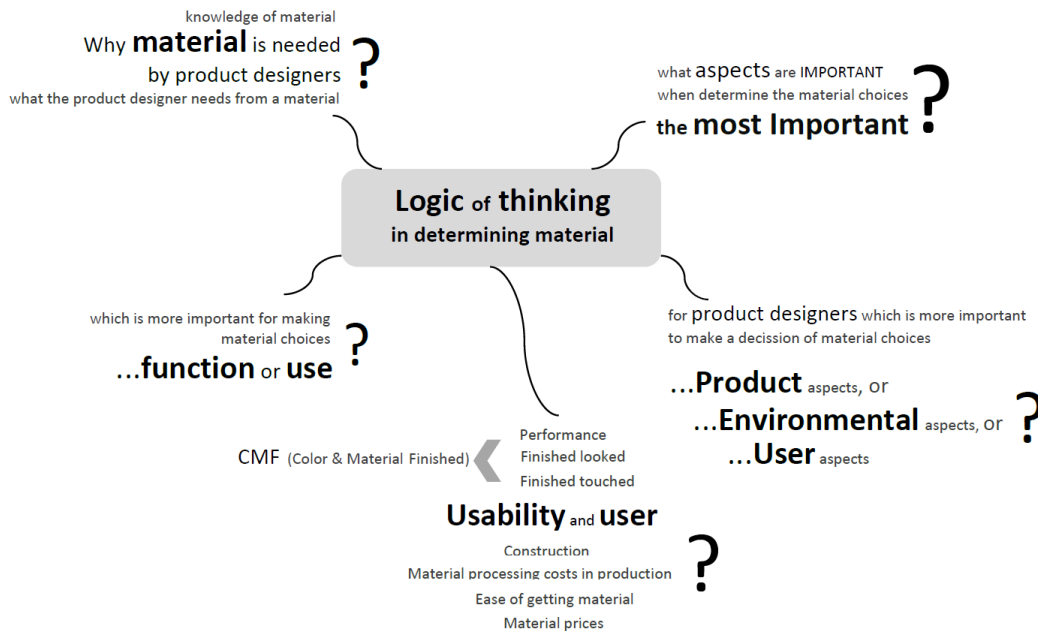


Figure 1. The logic of material importance in product design

The name of the course that was originally Knowledge of Industrial Materials is then changed to Materials for Product in 1<sup>st</sup> semester and Material and Production Process in 2<sup>nd</sup> semester. The word "industry" is omitted in the name of the courses, adjusting to the content of the learning materials provided. The learning materials given in the Materials for Product in the 1<sup>st</sup> semester includes an understanding of materials/natural materials and its derivatives such as; solid wood, plywood, rattan, bamboo, ceramics, and finished materials. The materials related to natural materials given in the 1<sup>st</sup> semester is based on the consideration that in the next semester, students will take several courses that require competency in understanding the characteristics of natural materials and derivatives such as Dimensions of Space and Product Design 1. While in the 2<sup>nd</sup> semester, continued from the Materials for Product course, which is Materials and Production Process, studies plastic, metal, and composite materials, which are widely applied in product design

### LearningMethods

The method of lecturer-centered learning that was previously applied puts the lecturer as the only source of learning. Lecturer fully controls the organization in class, learning materials, and lecture rhythms. This type of learning causes communication to occur only in one direction and does not stimulate critical thinking from students. This learning model was felt ineffective and then shifted to student-centered learning (SCL) where the role of the lecturer was no longer the holder of control but the facilitator. In relation to the Materials for Product course, the SCL learning model encourages students to think critically between analysis of material and its implementation in product design.

One of the higher education curriculum applied in universities requires that learning methods to be harmonized with learning outcomes, both graduate learning outcomes (LO) and course learning outcomes (CLO). Learning Outcomes include 3 characteristics, namely: learning outcomes can be specifically measured (measurable), learning outcomes can be specifically observed (observable), and learning outcomes is relevant to the competencies of the intended graduates (KKNI), which describes the mastery of knowledge, skills, attitudes and values. One learning method that is oriented towards learning outcomes and is suitable for application to the Materials for Product course is problem-based learning. Through this method, students are required to play an active role in arguing about the problems found and trying to find solutions. The method of problem based-learning in the course is then specified toward product design based learning where the problems in product design related to material are the topics raised for discussion. One example of the problem that has been discussed is about applying plastic to products used in everyday life such as toothbrushes.



Figure 2. Analysis of plastic application to toothbrush design

In this case, students analyze the use of materials on each part of the toothbrushes. The discussion does not only focus on the materials, but also on the aspects of design, environment, users, and solutions gained on the after-used aspect of the products. The discussion about handling after-used products is one that must be discussed with the aim of fostering a sense of responsibility for the environment due to the products they use. Each student displays his analysis through a presentation in front of the class by bringing product samples to be discussed together both in the form of questions and inputs. In this case the lecturer acts as a facilitator who will help provide answers and input if something is felt inappropriate.

## CONCLUSION

Learning materials in the Materials for Product course that emphasizes the logical understanding about the implementation of material on products is felt to be more effective and easily understood by students. Lecturers are not just delivering materials, but feedbacks from students are important factors that can build the atmosphere of discussion to life. The learning methods are also adjusted to

the trends expected by the students and industry (stakeholders) regarding competencies related to mastering the scientific material/material that graduates should have.

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