**CONTENT EXPERT PERSPECTIVE ON LEARNING MATERIAL QUALITY : AN EXAMPLE AT STATISTICS STUDY PROGRAM OF INDONESIA OPEN UNIVERSITY**

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**ABSTRACT**

This study discusses the results of the evaluation of the quality level of a number of self-instructional print material (SIPM) at Statistics Study Program of Indonesia Open University (Universitas Terbuka/UT) based on the assessment of their quality by content experts on 21 courses. The evaluation format uses the seven quality criteria on the nine chapters: the conformity with the development of the recent science, the integrity of concepts, the consistency of thinking paradigms, coherence of coverage, competence level, theoretical-practical relevance, and the relevance of the task/test. The quality of SIPM is also analyzed over chapters. It uses Multiple Factor Analysis (MFA) technique. Three dimensions represent 74% compromise variability of SIPM quality: rate of content eligibility (60%), then rate of conformity (68%), and then rate of task/test effectiveness (74%). The results show that there is no difference in content eligibility subject over topics. The most dominant criteria determining the content eligibility dimension is the presentation of a consistent and balanced method of thinking paradigm on the overall SIPM. There is a contrasting condition between criterion of SIPM quality in the conformity and the task/test effectiveness dimension.

Keywords: Self-instructional print material, conformity, test effectiveness

# **INTRODUCTION**

Universitas Terbuka (UT) is an open university, established in 1984 as the 45th state university to widen opportunity and access to university education, for in-service teachers, working adults and recent high school graduates. UT was founded as a part of the government’s national strategies to improve access and participation in higher education. In 2017, UT enrols more than 286,000 students, residing in different parts of the country, with over 90% of whom are working adults. UT has major roles to play in developing high-calibre human resources needed for the nation’s competitiveness and sustainable development. Since its foundation, UT has enrolled over 1.2 million students and has produced over 800,000 alumni, working in various fields of the profession.

Learning materials serve as major learning resources for distance learners, and quality learning materials help students learn effectively at a distance. A course team approach is used to design and develop UT learning materials, involving content experts from partner universities, UT’s own academic staff, and instructional designers and media specialists (Mutiara, Zuhairi, & Kurniati, 2007). Preparation for production of printed learning materials are done internally, while the large-scale reproduction is outsourced externally, and for the non-printed materials all production and reproduction processes are done internally. The learning materials go through a systematic quality assurance mechanism in each stage of design, development and production, in order to ensure that distance students have high quality learning materials for use in their autonomous and independent as well as structured and guided learning activities throughout the course of their learning endeavour at a distance.

UT students learn from the course materials delivered by the institution and from other learning resources accessible from other institutions. UT has developed multimedia learning materials for its students, with the printed materials as the major media supplemented with audio-cassettes, video programs, television programs, audiographic programs, computer-assisted instruction, web-based materials and online tutorials. Learner support is provided to facilitate student learning, such as tutorials, counselling, study groups as well as administrative services. Students’ needs for tutorials are provided and facilitated by regional offices.

In distance education the course materials serve as the major learning resources for students. The availability of high quality learning materials are crucial to facilitate the students’ learning process at a distance. Distance education systems have been established to expand access to learning, using a variety of technology. The philosophy of distance education is based on the value that it removes barriers to learning, and it allows for flexibility for students to learn what they want, when they want, and where they want (COL & Freeman, 2005). A variety of technology has been used to deliver knowledge for students to learn.

Printed learning material's reliability in achievement of subject competence is expected to be higher for PLM whose substance of material is feasible and its quality is consistent on the overall PLM (on each subject). This research evaluates SIPM material's quality on all SIPM material, from subject to topic. This research also identifies factors or dimensions that determine the differentiation of SIPM material's worth from one another.

By method, this research presents one application of MFA technique to evaluate the material quality of PLM that is observed repeatedly from chapter to chapter. MFAs are used against multivariet data structures that are repeatedly measured at the same observation. This simple analytical technique can explain the role of observations and variables on the whole system (known as compromise) (Abdi et al, 2013). According to this technique, the overall material quality of SIPMs is a compromise of a number of criteria measured over chapters. This technique produces dimensions of the compromise of SIPM quality, explains the role of criteria-variables, and explains the material quality positions of each SIPMs.

# **DESIGNING, DEVELOPING AND PRODUCING PRINTED LEARNING MATERIALS**

Effective design of instruction is essential, as in distance education it is the institution rather than the teacher teaches. The learning materials should thus be designed to be user-friendly for the learners’ self-study and independent learning activities. Designing effective instructional systems for distance learning involves activities which include identifying needs and goals, analysing instruction, developing materials and planning delivery system, piloting the materials, and revising the materials.

Learning materials serve as the major learning resource materials for distance students, in which the students learn from the printed learning materials (PLM) and have the options to choose from a variety of media that suit their learning needs and circumstances.

These variety of media include printed materials, audio cassettes, video cassettes, television programs, CD-ROM software, web-based supplement, Computer Assisted Instructional (CAI), and audio graphic programs. Learning materials development in UT involves a course team approach, comprising course authors, course reviewers, instructional designers, media specialists, and course managers. The course authors are responsible for writing the original manuscript of the course materials, and they are responsible for the content of the course. Course authors write courses referring to the basic course outline, while the course reviewers are responsible for reviewing of the course materials, and ensuring the quality standards of the content based on the basic course outline.

Instructional designers are responsible for ensuring that every printed material consists of several babes, depending on the number of semester credit unit of the course. Each babe consists of the following components: general and specific instructional objectives, introductory section, the content of the course comprising topics and subtopics, exercises, summary, formative tests, feedback, list of references, and glossary of terms. Instructional designers are also responsible to ensure that the babes are designed to be self-instructional to facilitate students to learn the materials independently with minimum assistance from the tutors (UT, 2005). The UT media specialists are responsible for identifying appropriate nonprinted media for use to support student learning at a distance. Non-printed media enrich the learning materials to facilitate the students’ understanding of the concepts and topics discussed in the printed materials.

The variety of non-printed materials provide students with greater flexibility to acquire knowledge. The course managers are responsible for ensuring the development process of the course materials in accordance with the requirement and schedule set by the institution. This course development process begins with the course writing, course review, editing, and finalising the course manuscript ready for printing. The UT learning materials are systematically designed to be selfinstructional, interactive and communicative in accordance with instructional design principles. They are self-instructional in a sense that they encourage students to learn the content actively and independently. They are interactive and communicative in that they include dialogues between author(s) and the students, they use communicative language, so that students have a feel that they have direct interaction with their own teachers.

Distance students have to familiarise and internalise themselves with independent learning style, and therefore the printed learning materials should include sections where students have to engage themselves in active learning, instead of passive reading. For example, students can be actively involved in working on a project, conducting small-scale research, solving cases, pronouncing words and sentences in foreign language courses, doing exercises, and taking self-assessment questions.

The course materials allow for students to have feedback from their tutors for their work and learning activities. They are also designed to enable students to do self-assessment on the exercises and formative tests on their own or in collaboration with their peer groups. In this way, distance students will be able to overcome the lonely feelings of the independent and autonomous learning processes (A. Suparman, 2007; Zuhairi, Zubaidah, & Daryono, 2008). In other words, UT printed materials are designed to consider not only the systematic presentation of the content but also other aspects relating to the precise communication process, delivery process, and pedagogical matters. The UT printed materials are designed in such a way to represent teaching and learning in the face-to-face mode of instruction, and it is designed to motivate the students in self-directed learning.

Hence, the content of the materials must focus on encouraging learners to study independently (Yunus & Pannen, 2004). The learning materials are structured in ways that they stimulate students’ independent learning activities, guide students’ learning of the content, and direct students to be able to understand the concepts through a variety of exercises and self-assessment. UT utilises academic resources from other institutions of higher education, and it prefers to outsource the development of course materials involving external course authors and material reviewers in writing and reviewing the materials. The course authors and material reviewers consist of senior academics and experts from well-reputed state and privates higher education institutions, such as University of Indonesia (UI), Bandung Institute of Technology (ITB), Gadjah Mada University (UGM), Diponegoro University (UNDIP), Padjadjaran University (UNPAD), Bogor Agricultural Institute (IPB), Education University of Indonesia (UPI), and Hasanuddin University (UNHAS).

# **SELF-INSTRUCTIONAL PRINT MATERIAL**

The main media of the Open University learning system is printed and non-printed materials. Self-instructional print material (SIPM) is a printed learning material and a major component for learning in UT. SIPM has a very tight structure and contains solid information and knowledge. Its design is to anticipate students if he only uses SIPM as the only source of learning (Pribadi & Syarif, 2010).

UT students use SIPM for self-study because it is easy to understand and provides a certain ability after learning it. SIPM should represent all aspects of learning, clearly described with language or instructional sentences, can measure students' understanding, with feedback on student learning outcomes. Quality learning materials should have a number of criteria (Suparman et al, 2012), such as validity and reliability learning material.

Seven factors must be considered for learning materials as effective (Malati, 2003), as follows: content accuracy (content validity and alignment), accuracy of coverage (depth of material, wholeness of concepts discussed in the field of science), digestibility (ease of understanding by users ), language usage (language selection, word selection, effective use of sentences, and meaningful paragraph forming), customization (packing and laying of information), illustrations (interesting, motivational, communicative, and helpful messages), and completeness of components (complementary components and evaluation of learning outcomes).

# **ASSESSMENT OF CONTENT FEASIBIITY ON SIPM**

The assessment of content eligibility is part of the initial stages of formative evaluation of learning materials. Formative evaluation aims to find the specific weaknesses in learning materials. Formative evaluation of learning materials is the process of providing and using information for SIPM quality improvement program, from material review, one-to-one evaluation, group evaluation, and field evaluation (Suparman, 2012).

Review of the material is done by an expert outside the instructional developer on the accuracy of the content. The material expert is expected to assess the following: the validity of the content and its relevance to instructional purposes; the accuracy of the formulation of general instructional objectives; the relevance of specific instructional objectives with the public; the accuracy of the formulation of specific instructional objectives; test relevance with instructional objectives; technical quality of writing test; relevance of instructional strategies with instructional objectives; product relevance or instructional materials with instructional tests and objectives; and, technical quality of instructional products.

The Open University develops a number of instruments for reviewing the quality of learning materials. One of them is Questionnaire Submission of SIPM by expert that is instrument with controlled docuoment code AJ10-RK02-R01 developed for review of SIPM content eligibility (Pusmintas, 2008). This instrument contains an assessment of the seven criteria for the quality of the SIPM content. Each of the criteria is scored by an expert in the form of a scale of compliance level and an explanation of advantage/disadvantage, comments, and/or suggestions.

# **METHODOLOGY**

SIPM content eligibility assessment is conducted in statistics study program by a content expert using the SIPM Assessment Questionnaire (AJ10-RK02-R01). During the year 2008 -2012 has generated expert assessment for 21 SIPM courses, each expert assesses one SIPM. All SIPM consists of nine chapters. Each chapter is given a score of compliance level for each criterion, the higher the score indicates the higher the criterion fulfillment level. The score and the criterion level fulfillment interval are as follows: score 1 if the learning material only meets less than 50% criteria; score 2 if the learning material meets less than 65% criteria, score 3 if the learning material meets less than 80% criteria, and highest score of 4 if chapter material meets 80% or more criteria.

The list of seven criteria is as follows: (K1) Material in accordance with the development of science, praxis in science/technology, (K2) Material explains a concept/principle thoroughly, (K3) Material presents a consistent and balanced method of thinking or paradigm, (K4) Materials are arranged logically, regularly and coherently, (K5) Degree of difficulty/depth of material according to program (S1) level, (K6) Material helps analyze the interrelationship between reality and theory or between theory and discussed, and (K7) tests relevant to the material.

Each SIPM has 63 criteria scores in each chapter. The score variables are coded according to chapter names and criteria. For example, M1K1 is the first-chapter appraisal variable on K1 criteria, and so on, up to 63 combined variables of nine chapters with seven criteria.

This data has the same one observational structure and is evaluated repeatedly nine times (chapters) for seven criteria. It is therefore necessary to evaluate how the level of the SIPM quality changes or remains on chapter to chapter. This data analysis uses Multiple Factor Analysis (MFA) technique (Abdi, Williams, & Valentin, 2013; Pagès, 2014). The process of data analysis using *R* version 3.3.3 with *FactoMineR* packages.

MFA is a popular method to analyze multi-block variable which is measured in the same observation. This technique is broadly and deeply peeled by the developer. It is also accompanied by the example and the program to analyze the process that uses *R* Program (Pagès, 2014). This analyses application is broadly accepted and performed by previous authors in some fields, such as quality control (Zarraga & Goitisolo, 2009) and economy (Garcı́a Lautre & Abascal Fernández, 2004).

# **DISCUSSION AND RESULT**

## **The role of chapter and criteria**

MFA provides the first three components that achieve 74.0% total of inertia, respectively for each component (dimension) are 60.4%, 7.4%, and 6.2% of inertia. The MFA also produces component loading to explain the role of the criterion variable in the components of material quality. Loading each variable shows the effect of variables on the component. The role of the variable to the component is measured by its contribution. These contribution can be summed to measure the total contribution of both criteria and chapters. The total number of contributions for all variables is equal to one for each component. The total contribution of each criterion and the total contribution of all criteria in each chapter toward dimensions is presented in Table 1.

Table 1. Total Contribution of Chapter and Criteria (%)

|  |  |  |  |
| --- | --- | --- | --- |
| (a) Chapter contribution\*  | Dim 1 | Dim 2 | Dim 3 |
| M1 - Chapter 1 | 10,5 | 8,8 | **18,6** |
| M2 - Chapter 2 | 11,5 | 10,8 | 7,5 |
| M3 - Chapter 3 | 11,6 | 10,1 | 6,4 |
| M4 - Chapter 4 | 12,2 | 5,2 | 9,8 |
| M5 - Chapter 5 | 10,0 | **24,6** | 12,0 |
| M6 - Chapter 6 | 11,4 | 3,7 | 10,3 |
| M7 - Chapter 7 | 12,0 | 5,2 | 8,5 |
| M8 - Chapter 8 | 9,0 | **20,6** | **18,8** |
| M9 - Chapter 9 | 11,8 | 11,0 | 8,1 |
| (b) Criteria contribution\*\* |  |  |  |
| K1 - Material in accordance with the development of science,  praxis in science/technology | 10,8 | **32,6** | 13,3 |
| K2 - Material explains a concept/principle thoroughly | 14,1 | 11,2 | 10,1 |
| K3 - Material presents a consistent and  balanced method of thinking or paradigm | **17,4** | 8,8 | 12,5 |
| K4 - Materials are arranged logically, regularly and coherently | 14,8 | 3,8 | 9,4 |
| K5 - Difficulty/depth of material according to under graduate program | 14,0 | 14,3 | 14,1 |
| K6 - Material helps analyze the interrelationship between reality and  theory or between theory and discussed | 15,0 | 6,6 | 15,4 |
| K7 - Tests relevant to the material | 13,9 | 22,7 | **25,1** |

\*) Total criteria contribution in a chapter ; \*\*) Total contribution of a criterion

The criteria of a consistent and balanced method of thinking or paradigm contributed 17.4% to the first component, then the criteria of interconnection between theory or theory with practical (15.0%), four other criteria (contributing an average of 14%), and the smallest contribution of developmental suitability criteria (10.8%). The criteria of conformity with the development of science contribute the largest (32.6%) to the second component, then the task/test criteria (22.7%), the depth of competence (14.3%), the whole concept (11.2%). Criteria of task relevance/test contribute the largest (25.1%) to third dimension, four criteria (K1, K3, K5, and K6) contribute to an average of 14%, and two other criteria (K2 and K4) contribute to an average of nearly 10%.



Figure 1. Contribution Plot of Chapters toward Dimension

Comparison of the role of the chapters (Table 1) to the dimension is represented by plot contribution in Figure 2. Each chapter contributes relatively equal to the first dimension, but differs to the second and third dimensions. The contribution of each chapter differs clearly to the second and third dimensions, ie between four chapters (M3-M4 and M6-M7) in contrast to the other five chapters. The most important chapter M8 determines the second dimension (along with M5) and the third dimension (along with M1).

In addition to inertia and dimension loading, the MFA also produces a score factor to explain the position of SIPM observations on the material quality dimensions. The scoring factors are presented as b-plots (in Figure 2) which project the position of each SIPM in two main dimensions of material viability, (a) SIPM positions in first and second dimensions, and (b) SIPM positions in the second and third dimensions .

The SIPM projection in plot (a) appears to separate SIPM positions 13 and 10. The material quality condition of these two SIPMs is in sharp contrast with the others. Projection of SIPM positions according to the second and third dimensions of the plot (b) separates SIPM number 9 and 13.



Figure 2. SIPM Projection based on two dimension score:

(a) First and second dimension, and, (b) Second and third dimension

## **The Dimensions of SIPM Quality**

SIPMs separated by the first dimension (Fig. 2-a) are generally SIPMs with low criteria scores. SIPMs 10 and 13 are located in far area because the scores of all the criteria are lower than the average of each criterion in each chapter. The SIPM positions in the first dimension explain the quality of the content of SIPM on all criteria.

The total contribution values ​​of each chapter to this dimension are consistent (uniform) from chapter to chapter. The largest contribution of this dimension is given by the consistent and balanced method of presentation or thinking paradigm (Table 1). This criterion becomes the main criteria in assessing the consistency (and alignment) of SIPM on each subject. Consistency is not only on one or more of the subject matter of the chapters, but on the whole of SIPM.

Based on the individual position of SIPM and the role of the criteria, the first dimension is identified as content eligibility (and material coverage). This dimension relates to the validity of the content and its alignment, breadth and depth of matter, and the integrity of the concept (Malati, 2003). This dimension is consistent throughout the material which means that the SIPM with a high score is eligible to use and reliable for the achievement of the course competencies. In Figure 2 it is shown that SIPM is generally reliable for the achievement of subject competencies, except for SIPMs 10 and 13.

In Figure 2, the second dimension separates SIPM positions from SIPM having a high degree of conformity (K1 criterion). The position of SIPM number 13 indicates a high level of development but contrasts with other criteria conditions. This second dimension is identified as a level of material upgrades with other criteria depending on the subject matter in the chapter.

The third dimension separates the SIPM-SIPM from SIPM which has a high test/assignment criteria score (criteria K7). The position of SIPM number 9 and 13 indicates a high level of task effectiveness/ test but contrasts with other criteria conditions. This third dimension is identified as the effectiveness of the task/test with other criteria depending on the subject matter in the chapter.

Thus, the three main dimensions of SIPM material quality according to expert material judgments are the extent of content-scope quality, level of updating, and level of task/test effectiveness. According to the criteria contribution, the first dimension (content and coverage quality level) of SIPMs is determined by the criteria of a consistent and balanced paradigm of thought in each chapter as well as between SIPM chapters. Unlike the first dimension, the second dimension (level of update) of SIPM material is different in each chapter and is generally contrasted with the content eligibility condition and the scope of the effectiveness of the task/test. Meanwhile, the third dimension (the level of task effectiveness/test) also varies in each chapter, as well as in contrast with the content eligibility condition and the scope of the material and the present condition.

Majority of reviewers opined that quality of content (content eligibility) was consistent due to links among topics and logically sequence. This indicate that the quality of content (or content eligibility) is at the same level over chapters. Freeman (2004) also described the indicators of quality of self-instructional material such as learners’ needs, abilities, logical link and sequence. Further Holmberg (1995), pointed out the elements required for effective writing of material such as activities, feedback or assessment questions, writing style (narative), easy language, attractive presentation and using daily life examples and illustrations. During this study researchers focused these aspects required for self-instructional material in distance learning system. Fortunately majority of respondents of this study opined that material was consonant with social demands.

As self-instructional material is indispensible in distance learning system and its quality can affect the learning of students (Sultana, 2016). It is established fact that all types of material either print, non print or self instructional are developed effectively on basis of clarity and relevance of the objectives. And objectives provide the standards and required criteria (Evans, Haughey, & Murphy, 2008). They also asserted that logical link of material makes the quality material and this material will enhance the learning of students.

Overall findings of this study will help the writers, course coordinators, reviewers and editors to make the self-instructional print material significant, accordance to recently development on sciences/technology, and effective self-assessment task/test. As the distant learners mostly rely on this material for their quality learning.

# **CONCLUSION**

The main dimensions of the SIPM quality at UT’s Statistics Study Program are: the content eligibility, validity component, relevance component, and self-assesment/task effectiveness. The content eligibility of SIPM is equal from one topic to another on the entire SIPM. The most dominant criteria to determine SIPM quality is the presenting method or thinking paradigm which is consistence and balance. Meanwhile, the rate of conformity and test effectiveness varies in each chapter, as well as contrast to each other.

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