Textbook Evaluation From Students' Perspective: Mathematics For Matriculation-Algebra

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ABSTRACT

Textbooks as one of the instructional materials have a vital role in teaching and learning process. Textbooks may assist lecturers and students by providing guidance in a certain subject. This study aimed to evaluate the quality of the textbook entitled, "Mathematics for Matriculation: Algebra (2nd Edition)". Garvin's framework which was based on the eight dimensions of product quality namely, performance, features, reliability, conformance, durability, service ability, aesthetics and perceived quality was used to examine the factors affecting the perceived quality of the textbook. In addition, contextual as one new dimension was used to measure the context of this book. This study employs a quantitative method approach using self-constructed questionnaire, with 37 items. The purposive sampling was used based on the characteristics of students who used this textbook in their Mathematics learning. The total number of students who completed the survey questionnaires was 283. Both descriptive statistics and Multiple Regression Analysis (MRA) were used for analysing the data. Findings reveal that features, reliability, aesthetic and contextual aspects of the mathematics textbook have affected on the perceived quality, which can promote the processes of teaching and learning and identify how the textbook meet the students' needs. Meanwhile, other variables such as performance, conformance and durability did not have any significant effect on the perceived quality of the Mathematics textbook. This study has provided crucial empirical information in evaluating textbooks and its factors. The findings have contributed to Garvin's framework that expand the existing literature and related theories. Furthermore, the findings will help the lecturers to understand which dimensions of the textbook must be rectified to enhance the effectiveness of this textbook.

Keywords: *Foundation studies, Garvin's framework, Mathematics, Quality textbook, Textbook evaluation.*

INTRODUCTION

Textbook evaluation plays an important role in the process of teaching and learning. This is particularly because high quality instructional materials will motivate students to actively participate in

their learning. Therefore, the contents of the material in a particular textbook should be analysed on different criteria/dimensions so that it can be further improved for use in the classroom. Weaknesses in any textbook contents may deter effective textbook reading. Hence, determining the effectiveness of a textbook is important to cater to the learners' needs. As pointed out by Hidayet (2010), evaluation is essential for the use of instructional materials such as textbooks. In the same vein, Shahrom and Yap (1991) stated that high quality instructional materials will motivate students to participate in the process of learning and teaching.

Several studies have been carried out to evaluate textbooks from different dimensions and subjects. Among other, Litz (2005) and Hidayet (2010) conducted studies on Teaching English as a Second/Foreign Language textbooks evaluation from students' and lecturers' perspectives in Korea and Turkey, respectively. Surveys on the evaluation of the six dimensions, which consist of layout and design, activities, skills, language type, subject and contents, as well as the whole aspects of those books yielded an acceptable degree of reliability between 0.60 and 0.80 of Alpha coefficient value. Nor Nazifa (2010) conducted an action research on the content analysis of a Mathematics textbook used by Form 5 students in Malaysia. One of the objectives of the study was to assess on whether or not the contents of the book support student-centred approach to learning. The outcome of the analysis indicated that the exercises of the textbook support student-centred learning.

The significant role of lecturers' input and acceptance in the selection of textbook is vital in preparing teaching materials (Zeringue et al., 2010). In their findings, curriculum leaders and selection committee did consider lecturers' readiness to use the textbook, the contents to be taught by them and how they would be taught so as to ensure the best possible implementation. The idea is supported by Nor Nazifa (2010), i.e., lecturers' awareness of the textbook contents will make their teaching in classroom more effective and meaningful. According to Good and Grouws (1979), the content and lecturers' method in teaching have significant effect on students' progress in Mathematics. Dyson (2004) asserted that feature and format of a textbook and e-textbook are the key factors for textbook effectiveness and also for engaging students in learning. Layout, format, font and performance of the textbook did not only affect the quality of a textbook but also the learning outcomes (Twyman, 1982).

Previous literatures in evaluating textbooks can be a good source to show the criteria, which are needed to evaluate a textbook. In 1987, Garvin suggested eight dimensions, which can be used to measure the quality of a product such as: performance, features, reliability, conformance, durability, serviceability, aesthetics and perceived quality. The description of Garvin's dimensions of product quality was adopted and adapted by Khaleed et.al (2009) as indicators for quality textbook. These descriptors with an addition of contextual descriptor were applied into the framework of this study. According to Suhirman (2018), in the field of teaching, choosing the best and proper textbook based on different context is very important. As such, evaluating the effectiveness of each textbook chosen is vital.

Despite the emphasis on usefulness and benefits of evaluating textbooks, still, there is lack of studies on how to evaluate a textbook and what criteria should be addressed (Mukundan & Ahour, 2010). Further, most of the previous studies focused on pre-use evaluation of textbooks (Lawrence, 2011). More studies are needed to focus on post-use evaluation of textbooks in particular Mathematics textbooks. Thus, this study aims to address this issue and fill these gaps and measure the effectiveness of the Mathematics textbook from students' perspective, apart from examining the factors affecting the perceived quality of the textbook.

RESEARCH DESIGN

This study adopted a quantitative research design, in which a survey method was employed. For this purpose, a set of a questionnaire comprising of 37 items was developed to measure performance, feature, reliability, conformance, durability, aesthetic, contextual and perceived quality of a mathematics book. The level of students' agreement was measured using 7-point Likert scale indicating the level of their agreement ranging from strongly disagree (1) to strongly agree (7), with (4) as neither agree nor disagree. The population for this study was selected from one public university in Malaysia. The total number of these students was 1218. The sample size, which was needed for the purpose of this study, was checked through a table provided by Krejcie and Morgan (1970). Based on the total number of the population, the recommendation sample size was 283. So, for the sample of this study, 283 students were selected. The questionnaires were distributed to 283 students at the Centre for Foundation Studies at a public university in Malaysia. Selection of the students was purposive based on the use of textbook entitled, "Mathematics for Matriculation: Algebra (2^{nd} Edition) used in teaching and learning of this subject. These students were purposively selected as their lecturers used the same book as the material in their teaching. In this study, the content validity and reliability of the instrument have also been addressed. After conducting the pilot study and removing two items, the overall reliability was .953, which was an accepted value of Cronbach Alpha for all the items (Tavakol & Dennick, 2011).

ANALYSIS PROCEDURE

In this study, the SPSS version 18.0 was utilised to reveal descriptive and inferential statistics. Mean, standard deviation and frequency percentage are also reported. In order to show the percentage of respondents' agreement, the responses of strongly agree, agree and somewhat agree as well as strongly disagree, disagree and somewhat disagree were presented as only two categories agree and disagree respectively (Table 2). Meanwhile, Multiple Regression Analysis (MRA) was used to reveal the model variance in this study.

RESULTS

i) Descriptive Statistics

283 students responded to the questionnaires, out of which 119 (42%) were male and 164 (58%) were female students who used this textbook. Majority of the respondents were Engineering students (n =124, 43.8%), as illustrated in Figure 1. About half [49.5% (n=140)] of the students who participated in the survey were in semester 3 of the academic year. Table 1 show a detailed breakdown of the demographic data.

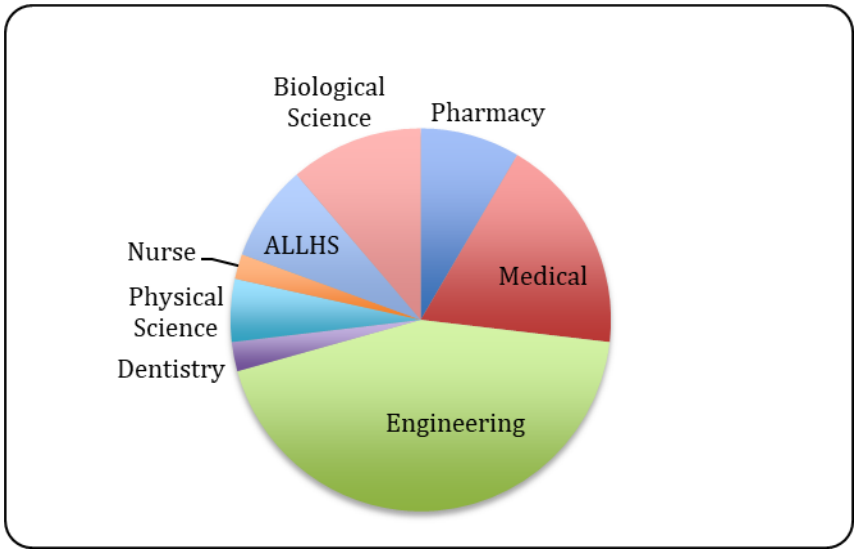

Fig 1 Distribution of students according to academic program enrolment

Table 1: Respondents' Demographic Data (N=283)

	Semesters				Total	Percentage
	SEM1	SEM2	SEM3	SEM4		
ALLHS	2	1	13	7	23	8.1%
BIOLOGICAL SCIE	0	1	17	14	32	11.3%
DENTISTRY	4	0	2	1	7	2.5%
ENGIN	27	8	71	18	124	**43.8%**
MEDICAL	20	0	31	1	52	18.4%
NURSE	1	0	3	2	6	2.1%
PHARMACY	23	0	0	1	24	8.5%
PHYSICAL SCIENC	5	0	3	7	15	5.3%
Total	82(29%)	10(3.5%)	**140(49.5%)**	51(18%)	283	100%

Descriptive statistics was used to examine the responses to each item determine the effectiveness of using the Mathematics textbook in teaching and learning. The results revealed that 94.7% of the students agreed that the format and font are visually readable. The least (61.5%) number of students agreed that worked examples, exercises and answers are error free (Table 2). However, responses that are neither agree nor disagree are considered as neutral, which is in the range of 4% to 23%.

Table 2 displays the mean scores that range from 4.69 to 6.0. In other words, the descriptive analysis showed that format and font are visually readable, which achieved the highest mean score among

all the items for effectiveness of the Mathematics textbook (M=6.0, SD = .917). This was followed by the contents of the book that covers the course outline (M =5.85, SD = .967). In contrast, the lowest mean is under this item (worked examples, exercises and answers are error free) with (M=4.69, SD=1.316). Thus, it is apparent students perceived that the format and font of the textbook are visually readable, while the contents of the textbook reveal the effectiveness of using that particular Mathematics textbook.

Table 2 Mean, Standard Deviation & Percentage of each Items in Evaluating Textbook

Items	Mean	Std. Deviation	Agree %	Disagree %
Contents of the book cover the course outline.	5.85	.967	91.9	2.8
There are enough (sufficient) exercises at the end of each section and chapter (to measure understanding of concepts)	5.65	1.212	86.9	7.5
Provides relevant exercises to reinforce what has been taught in classroom.	5.60	1.155	87.2	6.4
Exercises are related to the concepts of algebra.	5.82	.892	93	1.5
The content caters to students' needs in understanding mathematical fundamental concepts.	5.53	1.012	86.9	4.6
Contents promote an appreciation of cultural diversity	5.12	1.151	74.5	6.4
The exercises promote critical thinking.	5.63	1.151	88	6.7
The examples provided in the book support problem-solving skills.	5.36	1.219	79.8	8.9
The book includes enrichment exercises that support the format of exam questions (e.g., Cloned questions, Review Ex, Discussion Ex)	5.17	1.386	75.9	12
Questions provided in the exercises can accommodate Questions provided Questions provided in the exercises are catered to different levels of students' abilities.	5.55	1.158	86.1	5.6
Examples and illustrations are suitable/appropriate for the course contents	5.53	1.108	84.8	3.9
Contents in the book are correct.	5.12	1.223	74.9	10.2
Worked examples, exercises and answers are error free.	**4.69**	**1.316**	**61.5**	**16.3**
Provides accurate information that is understandable for students with many related examples and exercises.	5.25	1.165	79.5	9.6
Concepts are presented and explained clearly.	5.31	1.067	82.3	6.3
Contents promote Islamic values as specified in the university's mission/vision.	5.18	1.487	74.9	13.5
Materials in the text are sufficient to cover the course contents.	5.43	1.216	83.7	7
The binding of the textbook is durable.	5.67	1.128	89	3.6
The printing of the book is of high quality.	5.80	.984	91.6	2.5
The price of the book is something that I can afford compared to other similar books.	5.46	1.111	83.1	4.2
The title and sub-titles reflect the contents of the book.	5.78	1.062	90.4	3.6
The title and sub-titles give a clear idea of what is being discussed in each chapter or section of the book.	5.79	1.002	91.5	2.1
Format and font are visually readable.	**6.00**	**.917**	**94.7**	**1.4**
Graphic elements (diagrams, illustrations, graphs etc.) are helpful in understanding the contents of the textbook.	5.71	.975	90.4	2.2
Graphics are identified with labels and captions.	5.55	1.088	86.6	4.7
Page layout of the textbook is attractive.	5.29	1.242	80.6	7.5
Choice of colours in the book is appealing.	5.22	1.264	77.1	9.2
Examples, illustrations and pictures are in accordance to the local environment.	5.31	1.156	81.6	5
The book incorporates religious values, wherever appropriate	5.14	1.328	73.1	10.6
Contents of the book reflect the Malaysian culture.	4.80	1.282	63.7	13.4
Contents of the book promote good moral values.	5.02	1.298	70	11
Format of the book is visually appealing and appropriate for pre-university level.	5.67	1.063	89.4	3.6
Overall organisation of the textbook and presentation is effective.	5.55	1.052	78.9	4.3
The book can be recommended to others.	5.53	1.143	84.1	4.6
The overall impression of the textbook is excellent.	5.59	1.018	89.7	4.6

Note: N=283

ii) Predicting the Quality of Mathematics Textbook

In order to address the perceived quality of the Mathematics textbook, Multiple Regression Analysis (MRA) was used. The multiple regression results depict the influence of performance, feature, reliability, conformance, durability, aesthetics and contextual on the perceived quality of the Mathematics textbook, as perceived by the students. Table 3 reveals a model summary between the predictors (performance, feature, reliability, conformance, durability, aesthetics and contextual) and outcome (perceived quality).

Table 3: Model Summary of Predictors and Outcome

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.796[a]	.634	.624	.56399

The MRA, with all the predictors (performance, feature, reliability, conformance, durability, aesthetics and contextual) produces R^2=63.4% variance explained in the perceived quality. Thus, the results $F(7,275) = 68$, $p<0.01$ indicate a significant model, with each relationship contributes to the explanation of the model (Table 4).

Table 4: ANOVA Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	151.261	7	21.609	67.934	.000[b]
	Residual	87.473	275	.318		
	Total	238.735	282			

Feature, reliability, aesthetic and contextual influence on perceived quality at a significant level of $p <0.05$; with $\beta = .194$, $p = 0.001$; $\beta =.232$, $p = 0.000$; $\beta =.289$, $p = 0.000$; $\beta =.232$, $p = 0.000$, respectively. The results showed the significant relationships between feature, reliability, aesthetic and contextual aspects of the textbook with perceived quality at $p <0.05$. Meanwhile, performance ($\beta = .013$, $p = .826$), conformance ($\beta = .032$, $p = .517$), and durability ($\beta = .014$, $p = .790$) did not have any significant effect on perceived quality of the Mathematics textbook. The results are presented in Table 5 below.

Table 5: Multiple Regression

Model	Unstandardized Coefficients		Standardised Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.126	.281		.448	.654
performance	.015	.068	.013	.221	.826
features	.177	.050	.194	3.506	.001
reliability	.253	.054	.232	4.677	.000
conformance	.020	.031	.032	.649	.517
durability	.015	.058	.014	.266	.790
aesthetic	.342	.065	.289	5.234	.000
contextual	.195	.046	.232	4.236	.000

a. Dependent Variable: perceived quality

Discussions of Findings and Implications of the Study

The findings of this study have empirically supported that features, reliability, aesthetics and contextual aspects of the Mathematics textbook have impacted on perceived quality, which can promote the process of teaching and learning. The value $\beta = .289$ for the aesthetics dimension gave the highest impact on perceived quality. This is followed by reliability, contextual and features. Nonetheless, other variables, namely, performance, conformance and durability did not have significant effects on the perceived quality of the textbook. This result seems to be paralleled with the finding of Sheldon (1988). The findings of his study showed that some factors such as features, layout and availability impacted on the quality of the English textbook, as perceived by lecturers.

In addressing the effectiveness level of the Mathematics textbook, the findings showed that the item "the format and font which are visually readable, from item B7_25 (aesthetics dimension) achieved the highest mean score among the items for the effectiveness of the textbook ($M = 6.0$, $SD = .917$). The item in B1_1 for the performance dimension follows this, i.e. "the contents of the book cover the course outline" ($M = 5.85$, $SD = .967$). In contrast, the lowest mean was obtained by B3_13 (worked examples, exercises and answers are error free) with ($M = 4.69$, $SD = 1.316$).

This finding shows the fact that the format and visually readable font of the book has an impact on the effectiveness of the Mathematics textbook, as perceived by the students. It is evidently proven by the high percentage of students (94.7%) who agreed with the item, B7_25. This is also parallel with the finding of Dyson (2004) who considered that feature and format of a textbook and e-textbook are the key factors for textbook effectiveness and also for engaging students in learning. Twyman (1982) described that layout; format, font and performance of the textbook did not only affect the quality of a textbook but also the learning outcomes.

In terms of error-free worked examples, exercises and answers, only 61.5 % of the students indicated their agreement with this item. Hence, it can be concluded that the textbook examples, exercises and provided answers still contain errors, as perceived by the students. Thus, there is a need to ensure that textbook errors are properly addressed in future publication and research.

The findings of this study are significant to create awareness among book writers, university lecturers and those at Foundation Centres of the quality of this Mathematics textbook. So that, further modifications and improvements can be carried out on the book based on the research outcomes. It is also significant in providing details for and evaluating the quality of other textbooks.

The practical importance of this research has derived from students' perceptions and post-use evaluation compared to the previous research that were focused most on pre-use evaluation. The framework of this research was based on Garvin's Framework. Contextual as a new predictor was used to examine the quality of this textbook and the findings show that it has affected on the quality of the textbook. So, researchers can examine this factor in their future research.

CONCLUSION AND FUTURE WORKS

The findings are expected to be useful for lecturers as an instrument to help and guide them in evaluating and selecting the most appropriate Mathematics textbook for their students. It is also expected that the outcome of this evaluation study will reveal areas that need to be revised and improved in a particular textbook. Furthermore, this study is hoped to raise awareness of textbook writers to incorporate different dimensions when developing and writing Mathematics textbooks designed for any levels, be it for schools or higher learning institutions. This study can be extended to lecturers' perception of the Mathematics textbook. In particular, writers should focus on certain topics or sub-topics covered in the textbook that need to be refined and improved. Development of the instrument to measure textbook effectiveness can be used as a template for different subject matters and levels of textbook to ease lecturers in their analysis.

Furthermore, the findings of this research can be generalized, as there were enough number of respondents involved in the quantitative analysis, which lead to more comprehensive evaluation result. It is hoped that the findings of this research help the students and lecturers make the best decision in choosing the textbooks and evaluating the curriculum materials.

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