FORMATIVE EVALUATION: INSTRUCTIONAL MODULE ON DIFFERENTIAL CALCULUS

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ABSTRACT

This study determined the level of agreeable formative evaluation of constructed Instructional Material on differential calculus. The study employed the descriptive research design with questionnaire and interview questions as data gathering techniques including student's involvement index, communication index, and grade level readability. It utilized two mathematics professors and 70 students as target users from the Bachelor in Secondary Education major in mathematics.

The respondent-evaluators both faculty and students are strongly agree on the construction of the curriculum material in terms of objectives, accuracy of contents, clarity and appeal of the module. The level of originality and difficulty is average with high student's involvement index of 1.52, student feedback-based readability or communication index of 0.004 and level of readability is grade 11. There sult sets standard of excellence, and serves as instruments in the construction of a quality instructional module.

KEYWORDS: *Formative evaluation, external evaluation, instructional module, Differential Calculus, derivative, mathematics, involvement index, communication index and readability.*

I. INTRODUCTION

Evaluation plays a very important role in our daily lives and in our society especially in making decisions. It is synonymous with appraisal, decision-making and judgment, for instance industries evaluate their products, materials, processes, and human resources to provide data to make decisions. Citizens evaluate the effectiveness of elected government officials to make judgment in future elections. In schools and universities, we evaluate faculty, instruction, students, curricula, physical facilities, administrators, and other components of instruction in order to improve the educational initiative.

Evaluation as defined in the dictionary is "the process of as certaining or judging the value or amount of something by use of standard of appraisal" (Good, Dictionary of Education) and

"to determine the significance or worth of a phenomenon usually by careful appraisal and study"(Webster dictionary). In the field of educational evaluation, Wor then and Sanders (1973) unified these two definitions into one as follows: "is the determination of the worth of a thing. It includes obtaining information for use in judging the worth of a program, product, or objective, or the potential utility of alternative approaches designed to attain specific objectives."And according to Sara pin (1977) evaluation is connected with the central theme as ascertainment, the determination and the judgment of worth. Thus, it is a tool utilized to survey, examine, measure, appraise and compare the relative attributes of an array of educational endeavors.

Evaluation in education generally refers to "the collection and use of information to make decisions about an educational program" (Cronbach, 1963). Most attempts at evaluation are based upon this definition, some delimit or expand the definition. For instance Scriven (1967), distinguished between formative and summative evaluations of instructional materials. According to Scriven's definition, formative evaluation is that which occurs during the development of the instructional materials with its main purpose is to identify ways in which the instruction can be improved as it is being developed and the role of it applies to educational processes and product under development. Summative evaluation refers to the assessment of the final instructional outcome with its main purpose to assess the effectiveness of the completed product with minimal interactions between the instructional developers and the users of the product. The role of summative evaluation applies to finished processes and products.

The focus of this study is on the formative evaluation activities of personalized system of instruction in Calculus. Formative evaluation of instructional material according to Cunningham (1972) is the gathering of information which would be used to the developers of instructional materials, to choose or produce the parts and to combine the elements to form a successful whole. Formative evaluation incorporates the collection and utilization of feedback data to developers of instructional materials. The formative evaluation activities of

this study is to facilitate further assessment, revision, and improvement of the educational process or product of instructional material under development.

Hence, the study was conducted not merely to construct an instructional material that will support the student in understanding and applying the basic concepts of calculus but it is extended to its formative evaluation of the IM by utilizing experts from the field of mathematics and student clients in particular. Evaluation is an integral and important part of IM development. Formative evaluation according to Bloom et al. (1971) in curriculum development refers to the evaluation when the material is being formed or written. The result of a formative evaluation are used in the revision of a curriculum material before it is published or printed for dissemination.

In this study, the evaluation of the constructed module are both qualitative and quantitative evaluation. A quantitative part yields numbers while qualitative evaluation is expression of words. Usually in module evaluation favorable result of the quantitative evaluation may uplift the author.

Doll (1996) points out criteria of IM documents as material that truly communicate are clarity, credibility of developers or authors, and evidence of professional editing. He further recommends the use of modern technologies such as multimedia, computer or automated which the user can manipulate and interact with. Whatever technology is used, the following criteria of well written IM remains: accuracy of material, clarity of material, appeal to target users, and originality in presentation. Qualitative evaluation in the form of suggestions is more useful to the author in revising the curriculum material. One essential criteria for evaluation of curriculum is the attainment of its objectives using appropriate test item as an indicator for the attainment of the objective. Content analysis is another way of determining that the module is written that enables students to achieve their objectives.Another criterion is originality of the curriculum materials measured in terms of innovations in presentation of concepts and skills. Which includes clarity and appeal of the module to the students.

The foregoing gave the interest to the researcher to conduct the present study to improve the instructional material on differential calculus. How agreeable is the instructional module on differential calculus to colleagues and target users? Surely these problems need to be answered; hence the present study was conducted.

Significance of the Study

In the field of mathematics, many concepts are quite difficult to understand, so, there is a continuous search for approaches and methods that would expand students' learning process. Some studies support the use of individualized system of instruction in helping students perform effectively.

Personalized System of Instruction of PSI is an alternative form of formal education. If the PSI would be fully applied, it would help in upgrading the quality of education. It can also help varied students especially the slow learners.

The Personalized System of Instruction or PSI is an instructional material, an innovative devised to overcome the difficulties in learning in the absence of instructor/educators to answer student's query. Objectives of a PSI are influenced by global, national and institutional goals and baseline data on needs and resources of target users. In addition, when it is difficult for an educator to clarify a point or correct himself, it is essential to provide material that can guide the student in every step and anticipate most information requirements. Furthermore, an instructional material, or PSI requires a level of detailed subject analysis that is better than conventional classroom situations.

PSI, in the form of a printed study guide, is widely used in teaching. This material was organized in such a way that learners can do most of their learning from the material.

Learners understanding of the subject differential calculus in a practical sense is difficult based on data gathered from standardized tests and classroom based assessments. Students' current level of performance in this subject is "very low". Thus, the goal for this module is to train the readers to overcome difficulties in learning calculus, improve

understanding and skills already attained in high school, correlate the ideas and procedures drawn from arithmetic and high school algebra, build strong ground for study of higher mathematics course, and apply principles learned in solving related problems and exercises.

Finally, the importance of PSI in learning can be seen in terms of the opportunities for the individuals to develop their abilities. This emphasize that the modes of teaching must be parallel by an attempt to give an individual an opportunity to his or her learning.

Objective of the Study

The main objective of the study is to develop an instructional module in the form of a printed study guide, known as Personalized System of Instruction (PSI) on differential Calculusand to analyze gathered formative evaluation data for further improvement of the module.

Specifically, the author aim to:

1. Design an instructional material that is capable of presenting differential calculus concepts in its simplest and comprehensive lesson design and can stimulate the interest of the prospective learners to carry on with their learning.

2. Construct andadminister instruments for collecting feedback on the module from the colleagues and targets users, and

3. Analyze gathered formative evaluation data in terms of

    a. congruence of curriculum materials with its objectives,

    b. accuracy of material,

    c. clarity of material,

    d. appeal to target users,

    e. originality in presentation,

    f. student involvement in the module,

    g. cognitive demand of the module, and

    h. readability of the module.

Scope and Limitation

The choice of differential calculus is quite personal as well as in consideration of the Calculus 1-differental calculus course. Differential calculus 1 is preparatory topic before integral calculus.

The design and construction of the module could have been better in its presentation and illustrations if there were no boundaries, such as limited time for research and blending of ideas for different references, limited resources from which could have managed the presentation and reproduction of the module.

II. METHODOLOGY

The study employed the descriptive research design with questionnaire as a primary data gathering tool. Interviews were also done to supplement the information contained in the questionnaires. The study collected feedback on the module and analyzed formative evaluation data in terms of: congruence of curriculum materials with its objectives, student involvement index, cognitive demand and readability level.

Data-Gathering Instrument

The data gathering instruments used to obtain the data needed for this study was the researcher-made questionnaire checklist to determine the respondents' agreeable comments of congruence of curriculum materials with its objectives, including written marginal notes-corrections, suggestions, reactions –on the module itself.

Analysis of formative evaluation data in terms of

   a. Student involvement in the module using Romney (1968) procedure.
   b. Cognitive demand of the module and
   c. Readability of the module using Fry (1968) procedure.

Research Procedure

The requirements for this study were accomplished by the author by doing the following activities:

1. The author studied the Mathematics curriculum to determine the topic for the specific PSI module.

2. The author constructed the outline of the Instructional material.

3. The author also reviewed the basic concepts and discussed with experts about the accuracy of certain concepts and skills.

4. The author consulted some textbooks in Calculus and finalized the concepts to be tackled.

5. The author started writing the instructional materials.

6. The author submitted the finished instructional material to the expertevaluators and students target usersfor feedbacks to get formative data and revisions.

7. The author constructed an instrument/questionnaire to include for the evaluators list words, figures and tables in IM that they find unclear as they go through the modules. Included in the questionnaire an item on student's suggestion for improvement of the module.

8. The author reproduced 72 copies of IM. The expert and students evaluators read the IM and perform the activities and experiment in the module.

9. The author requested two subject matter specialist (two most senior experience colleague/ one with the highest degree in mathematics subjects) and 70 students randomly selectedfrom BSEDto evaluate the module on thefive criteria: attainment of objectives, accuracy of content originality, clarity and appeal. Two (2) evaluators to get the average or inter-correlation of the ratings of evaluators.A copy of IM was given to the evaluators to read and perform the activities and experiments in the module which include the directions of writing marginal notes-corrections, suggestions, reactions –on the module itself.

10. Further evaluation of the appeal and clarity of the module using the student involvement index of Romney's (1968) procedure. Using Romney's procedure, the author randomly selected ten pages of the module then starting with the first paragraph, on each 10 pages of the module, classify the first ten sentences according to categories such as facts, definitions, questions, questioned used by students for Category I and for Category II which involves students requiring

them to analyze, conclude and perform activity. Next step is for each page, count the total number of sentences for each category. Now, to compute the student involvement index, we get the ratio of category 2 and category 1 which is equal to $\frac{Total\ for\ Category\ II}{Total\ for\ Category\ I}$.

11. Further evaluation of the readability of IM using that of Fry's (1968) procedure. First step is counting the number of sentences and number of syllables in each of the three 100 word samples skipping proper nouns then compute the average number of sentences and average number of syllabus of the three samples enter these average in a Table. Plot on the graph in Figure 1 the point with average number of sentences as y coordinate and the average number of syllables as x coordinate. The graph level in the readability graph (Fig. 1) are based on norms in the United States at the time the data were collected. The Philippines norm is two grade levels lower. The grade level of the module is College subtract two that is Grade 11.
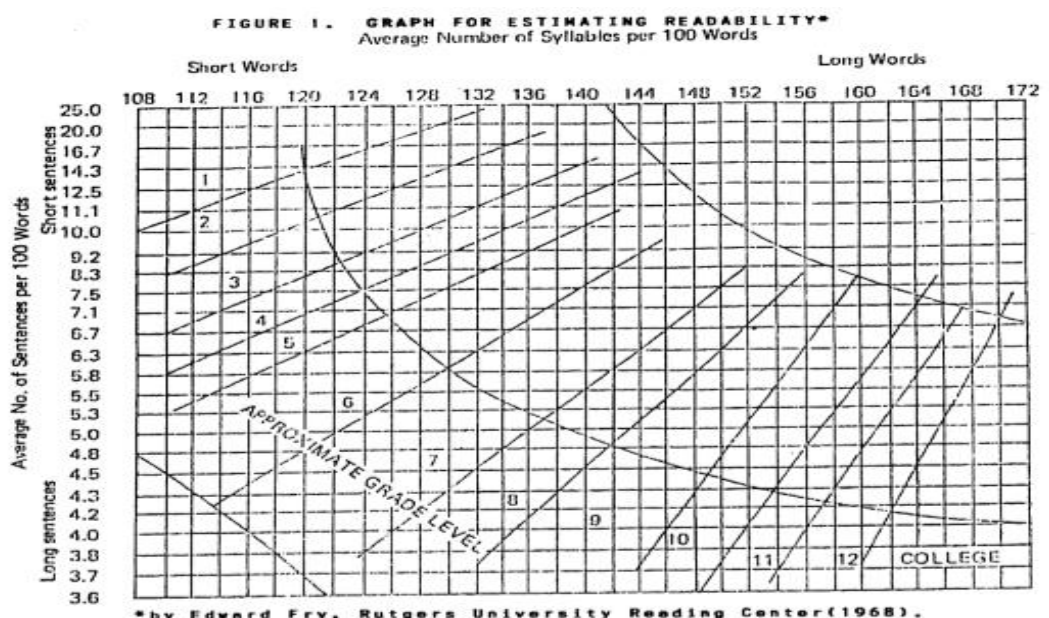

Figure 1: Graph for Estimating Readability

12. Revisions of the module were made according to the recommendations of the evaluators.

13. Finally, the author has written the final PSI material.

III. RESULTS AND ANALYSIS

Analysis of formative evaluation data from two experts and students evaluators in terms of (a.) congruence of curriculum materials with its objectives, (b.)student involvement in the module(c.) cognitive demand of the module and(d.)readability of the module.

A. Evaluator's Formative Evaluation

From the expert/colleagues' perspective the two strengths of the curriculum material are: the concepts are systematically and properly presented andthere is an integration of visual elements and figures.

Table 1 shows the five criteria of module evaluation from two experts in terms of the congruence of material with its objectives, accuracy of contents, clarity, appeal and originality and difficulty. In general the weighted mean is 2.46 strongly agree. All five areas are strongly agree .As reflected on the first criterion objectives of the module, rated "strongly agree" with a mean of 2.58. This means that there is a strong congruency of the curriculum materials with its objectives. Under the accuracy of the material it is rated strongly agree as reflected in the sub mean and also with the Clarity of Module which is 2.29 from the view point of the user.

Appeal to the user is also one of the criteria from the viewpoint of the user. The sub mean is strongly agree. All necessary elements has been successfully integrated into learning sequence, layout of pages is well organized and with colored pictures and as a whole the module appears interesting with teaching strategies that catch and sustain students' attention and interest.

The level of originality and difficulty of the module from user's perspective is average. This means that the curriculum material has some new presentation of concepts and skills but no new created scientific or mathematical concepts.

Table 1: Evaluation of Two Colleagues on the Personalized System of Instruction

I. Objectives of the Module	Weighted Mean	Adjectival Value
A. The module meets a clearly defined need.	3.0	Strongly Agree

B. The purpose of the module has been clear to all likely users.	2.5	Strongly Agree
C. The aims clearly relate to the purpose of the module.	3.0	Strongly Agree
D. All the general objectives clearly relate to the purpose of the module.	3.0	Strongly Agree
E. Each set of specific objectives leads to the achievement of its relevant general objectives.	2.0	Agree
F. Results of the post-test have been clearly interpreted in terms of achievement of the objectives.	2.0	Agree
Sub-Weighted Mean	**2.58**	**Strongly Agree**

II. Accuracy of Content

A. The module introduction gives a clear account of the scope.	3.0	Strongly Agree
B. The entry behavior of potential users has been carefully described in terms of comprehensive list of knowledge and skills.	2.5	Strongly Agree
C. All content is directly relevant to the objectives.	3.0	Strongly Agree
D. The content has been arranged in a logical learning sequence.	3.0	Strongly Agree
E. Each unit of module is in clearly defined category of the content of the module as a whole.	3.0	Strongly Agree
F. The units form a series of logical steps in the learning sequence.	3.0	Strongly Agree
G. The module concludes with a comprehensive summary of all main points.	2.0	Agree
H. The post-test includes at least one item for each specific	2.5	Strongly

objective.		Agree
I. The form and wording of each item in the post test is appropriate for the objective it is intended to assess.	2.5	Strongly Agree
J. All post-test questions have been answered clearly and unambiguously.	2.5	Strongly Agree
Sub weighted Mean	**2.70**	**Strongly Agree**

III. Clarity of the Module

A. All activities are appropriate for their content and objectives.	3.0	Strongly Agree
B. All learning activities promote active participation and response.	2.5	Strongly Agree
C. Each learning activity is divided into small steps.	3.0	Strongly Agree
D. All learning activities have been clearly planned as input-process-output cycles.	2.5	Strongly Agree
E. Appropriate Practice Task (Feedback) questions and answers have been included at all necessary points.	2.0	Agree
F. All practice task questions have been answered clearly and unambiguously.	2.5	Strongly Agree
G. All practice task questions have been interpreted in a satisfactory manner.	2.5	Strongly Agree
H. Practice tasks have been included at all necessary points in learning sequence.	3.0	Strongly Agree
I. Effective reinforcement statements have been included at necessary points.	1.5	Disagree
J. Continuity of learning has been ensured by the inclusion of bridge passage at all necessary points.	1.5	Disagree
K. All instructions are clear and easy to follow.	2.5	Strongly Agree

L. The length of time needed to complete the module would appear optimal for the types of intended learners.	1.0	Disagree	
Sub weighted Mean	**2.29**	**Strongly Agree**	

IV. Appeal of the Module

A. All visual elements have been success integrated into learning sequence.	3.0	Strongly Agree
B. The layout of the pages is well organized making the module appear interesting and easy to study.	2.5	Strongly Agree
C. Wherever appropriate a touch of humorous has been added by using cartoons, humorous comments etc.	1.5	Disagree
D. Satisfactory consolidation passages have been included wherever appropriate.	2.5	Strongly Agree
E. On the whole the module appears interesting and likely to motivate learners.	2.5	Strongly Agree
F. All aspects of the module are well integrated giving a high probability that it will be a successful learning resource.	2.0	Agree
G. In general the module can be used for various purposes and wide range of learners including working personnel.	2.0	Agree
Sub weighted Mean	**2.29**	**Strongly Agree**
Over All Weighted Mean	**2.46**	**Strongly Agree**

Legend: 0 - 0.75 Strongly Disagree (SD)	0.76 – 1.50 Disagree (D)
1.51 – 2.25 Agree (A)	2. 26 – 3. 00 Strongly Agree (SA)

V. Originality and Difficulty of the Module

A. Relative to other university modules you have taken, the intellectual	Average

challenge presented.

B. Relative to other university modules you have taken, the amount of effort   Average
you put into this module was…

The two experts have given some of the suggestions for the improvement of the module, these are: (a)there must be more examples to be given which starts from the simplest to complex, (b)the module must be more interactive, (c)a simple introduction of each lessons/topics to set the minds of clientele and for them to have an idea of what will be the next topic is going to be, (d)the examples are limited to two items only, (e) it must be at least three illustrations, (f)examples in varying degrees, (g)more graphical presentations of the concepts, (h)consistency of symbols/ subscripts, and (i)provision of answer key to all SAQ's and statements/s that would give them signed or dialogue to continue to the next lesson /topic.

B. Student's Formative Evaluation

Table 2 shows the students' qualitative feedback for the module in general, the students rating is"strongly agree" on the four criterias in terms of congruence of material with its objectives, accuracy of contents, clarity, appeal and originality and difficulty with an overall weighted mean of 2.46. Specifically, on the student's view point there is a strong congruency of the curriculum materials with its objectives rated it as "strongly agree" with a mean of 2.50. The curriculum material present accurate concepts and skills as reflected in the sub mean of 2.36. On the clarity of module the sub mean is 2.40 "strongly agree", it effectively communicated the learning activities appropriate for concepts and objectives. The material is appealing to the userwith a sub mean of 2.56 is strongly agree. Lastly, the module is average on the criterion of Originality and Difficultyfrom the target user's perspective.

Table 2: Students' QualitativeFeedback (Weighted Mean) for Module Evaluation

I. Objectives	Weighted Mean	Adjectival Value
A. I understand the objectives very clearly.	2.56	Strongly Agree
B. It was easy to understand what I was expected to do.	2.44	Strongly Agree
Sub-weighted mean	2.50	Strongly Agree
II. Accuracy of Content		
A. I could work through the module without too much difficulty.	2.31	Strongly Agree
B. I understood the ideas in the module.	2.50	Strongly Agree
C. The quiz questions (practice tasks) were easy to answer.	2.06	Agree
D. Module presents various ideas/concepts in a sequence easy to me remember.	2.56	Strongly Agree
Sub-weighted mean	2.36	Strongly Agree
III. Clarity of Module		
A. I could do all things the module instructed me to do.	2.13	Agree
B. The ideas in the module were interesting.	2.31	Strongly Agree
C. The words used were easy to understand.	2.63	Strongly Agree
D. The styles of written expression were just right for me.	2.31	Strongly Agree
E. The text was free of unfamiliar words.	2.13	Agree
F. The module made it easy for me to study this topic.	2.56	Strongly Agree
G. I enjoyed working through the module.	2.44	Strongly Agree
H. I find the module facilitating in my course completion.	2.69	Strongly Agree
I. Presentation of practice task and summary at the	2.38	Strongly Agree

end of each subtopic helps me in understanding.

	Weighted Mean	Adjectival Value
Sub-weighted mean	2.40	Strongly Agree
IV. Appeal of the Module	**Weighted Mean**	**Adjectival Value**
A. The module is as good size for easy handling.	2.81	Strongly Agree
B. The layout of the pages is attractive and modern.	2.50	Strongly Agree
C. The type size used for the text is easy to read.	2.94	Strongly Agree
D. There are right proportions of diagrams and photos.	2.44	Strongly Agree
E. The diagram and photos are well placed for easy reference.	2.38	Strongly Agree
F. Tables are generally well laid out and easy to follow.	2.60	Strongly Agree
G. The text is well arranged on the page so that it is easy to read and follow.	2.63	Strongly Agree
H. All instruction stands out clearly from the rest of the text.	2.38	Strongly Agree
I. Key points and concepts are well highlighted for focused attention while reading.	2.31	Strongly Agree
J. Titles and subtitles (i.e. super-ordinates and sub-ordinate concepts) are clearly brought out.	2.56	Strongly Agree
Sub-weighted mean	2.56	Strongly Agree
Over all Weighted mean	2.46	Strongly Agree

Legend: 0.0 -0.75   Strongly Disagree (SD)   0.76 – 1.50   Disagree (D)

1.51 – 2.25   Agree (A)   2. 26 – 3. 00   Strongly Agree (SA)

V. Originality and Difficulty of the Module

A. Relative to other university modules you have taken, the intellectual challenge presented.   Average

B. Relative to other university modules you have taken, the amount of effort   Average

you put into this module was…

Qualitative Feedbacks and Opinions of Students

Question #1: Which aspects of this module did you least enjoy?

Response (1): *Explanations of different figures, the graphs, the proof on theorems, and the geometric interpretation of derivative.*

Response (2): *The format of the module is not that captivating. It lacks the emphasis and every space of the pages is not properly managed.*

Response (3):*I find it hard and boring to understand because it is too long.*

Response(4):*Too much pictures signifying formulas and activities are somehow destructive when reading the content of the module.*

Question #2: If you could improve one aspect the way in which this module is taught, what would it be?

Response (1):*More exercises/examples or drill activities on every topic and answers to SAQ's so that readers could assess their learning /understanding in every topic.*

Response (2):*A need to have an overview of the module and a Teacher's guide.*

Response (3):*Closure or summary of concepts and an open ended questions.*

Response (4):*A necessity that examples are arrange based on the level of difficulty (easy, average and difficult).*

Response (5):*Additional prerequisite concepts and processes. (6)Improve the format, icons, highlights all key points and concepts in the module to give emphasisand (7)Brief explanations in some of the illustrations.*

Question #3: Which, if any aspects would you liked changed? Can you suggest improvements…

Response (1):*A need of prerequisite concepts and*

Response (2):*Maximize spaces, more attractive objects/designs/pictures to capture or motivate the students or lessen images/pictures /images that will detract the mastery of concepts*

C. Student Involvement Index of the Module

Table 3 shows the student involvement index of the module using the procedure of Romney (1969). The computed student involvement index is $\frac{Total\ for\ Category\ II}{Total\ for\ Category\ I} = \frac{32}{21} = 1.52$.

The result shows a ratio greater than 1 or a higher student involvement index. This means an active reader that involves the senses, for instance, sight, sound and touch, of the reader. Involvement of the reader in the material makes it interesting. It is widely believed that activities also facilitate learning by doing.

Table 3. Ten Pages of the Module to Compute for Student Involvement Index

Category	Number of Sentences										Total
	Page 4	Page 7	Page 9	Page 10	Page 11	Page 16	Page 24	Page 27	Page 31	Page 33	
I. 1. Facts		5					1				6
2. Stated Conclusion	2		1				1		2		6
3. Definitions	1		1				1	1	1		5
4. Questions answered immediately									1	3	4
Total for I	3	5	2	0	0	0	3	1	4	3	21
II.5. Questions requiring student to analyze data			1		1				1	1	4
6. Statement requiring student to formulate conclusion			1	4	1						6
7. Directions to student to			2		5	5	1	4	1	2	20

perform and analyze some activity and solveproblems											
8. Questions to arise student answer and not answered immediately.						2					
Total for II	0	0	4	4	7	7	1	4	2	3	32

D. Grade Level of the Module from Readability Graph

Table 4 shows the grade level readability or reading ease of IM using a common readability procedure that of Fry (1968). The grade level of the module is College subtract two that is Grade 11.

Table 4: Number of Sentences and Syllables Per Hundred Words

Page	Number of Sentences	Number of Syllables
First Page (Page 1)	6	190
Middle Page (Page 17)	5	160
Last Page (Page 35)	5	165
Average	5.33	171.67

E. Communication Index for Words of the Module

Processed data collected in Table 4 will be used to compute for the communication index. Using the three 100-word samples in Table 4 where the respondents have listed unclear words, counting the number of readers or tryout students who found a word in the sample unclear. Doing these for all unclear words in the sample. The total number of words,

Nx, is 300 words (3 samples x 100 words per sample). Also counting the total number of readers, Nr.

The feedback-based readability or communication index, CI, for words of the module (Talisayon, 1983):

$$CI = \frac{Sum\ of\ (fX)}{(Nr)(Nx)}$$

N = no. of readers indicating a given unclear word.

f = no of times unclear word appear in the samples of words

Nr= total number of readers

Nx = total number of words in the samples

There are 6 words (***composite, instantaneous-3times, motion, displacement, implicit***, and ***traversed***) that are found unclear out of 300 words in the three samples. They appears once except the word ***instantaneous*** which appears thrice in the samples. Further, a single student who found these words unclears.

$$CI = \frac{(1)(1)(1) + (1)(1)(3) + (1)(1)(1) + (1)(1)(1) + (1)(1)(1) + (1)(1)(1)}{(300)(6)} = 0.004$$

The Communication Index of the module is 0.004 between the acceptable values for CI.The range of acceptable values for CI is : $0 \leq CI \leq 0.1$. Thus the communication index of the module is agreeable and acceptable.

IV. DISCUSSION

The study concerns itself with the construction of Personalized System of Instruction on Differential Calculus an alternative to lecture. Topics were grouped into five namely: The tangent line and the limit in relation to derivative, formal definition and five step rule of derivative, physical interpretation of derivative as instantaneous velocity, theorems of differentiation with their proofs and examples and higher order of derivatives and application.

The second phase of the study is getting feedbacks/formative evaluation data from experts and target users to further improve the module.

The module provided lectures, appropriate examples, self-assessment or feedback and modified prompters to attract the readers. Several features were added to meet the objectives of the study. The PSI covered differential calculus. Definitions, illustrations, theorems, and proofs were designed, constructed, revised and evaluated with the help, supervision and evaluation of experts and target users. The evaluators checked the data in terms of:

1. congruence of curriculum materials with its objectives;
2. accuracy of material;
3. clarity of material;
4. appeal to target users;
5. originality in presentation;
6. student involvement in the module;
7. cognitive demand of the module; and
8. readability of the module.

PSI is a medium of instruction to resolve the concern of professors for their students. It is a self-pace student -centered teaching and an alternative form of teaching. This will be a relief on the part of instructor since it will help them teach effectively with lesser effort in their part. The PSI uses text and other reading materials to present the concepts covered in the discussion. There are many factors to be considered in making PSI some of these are: the subject itself, individual differences, and the combined interest of the student as well as the teachers.

From the findings, the study concluded that the two colleagues strongly agree (2.46 SA) on the construction of the PSI material in terms of objectives (2.58 SA), accuracy of contents (2.70 SA), clarity of module (2.29 SA), Appeal of the module "2.29" SA. The originality and difficulty of module is average.

From students' qualitative feedback for the module, in general, the students strongly agree on the four criterions in terms of congruence of material with its objectives (2.5 SA),

accuracy of contents(2.36 SA), clarity(2.40 SA), appeal(2.46 SA) and originality and difficulty with an overall weighted mean of 2.46.

The module has high student involvement index of 1.52,with communication index of 0.004 between the acceptable range and the level of readability is Grade 11 from the readability graph.One inference is the module has greater word length and sentence length with higher grade level.

CONCLUSION AND RECOMMENDATIONS

The respondent-evaluators both faculty and students are strongly agree on the construction of the curriculum material in terms of objectives, accuracy of contents, clarity and appeal of the module. The level of originality and difficulty is average with high student's involvement index of 1.52, student feedback-based readability or communication index of 0.004 and level of readability is grade 11. The result sets standard of excellence, and serves as instruments in the construction of a quality instructional module.

The author would like to recommend the following for the improvement of the paper:

1. Add more graphics, visuals, designs and other colorful features to the PSI to make the material more lively and interesting to read.
2. More self-assessment questions to test students comprehension skills.
3. Include readiness test and key, study guide, mastery test and key and teacher's guide.
4. More difficult and abstract concepts, higher thinking skills and higher –level activities since the intended level is higher than the graph level.

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