



A Validated Module in Biological Science for College Students in the Philippines

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Abstract – This study could be the first attempt in developing instructional materials for use in Higher Education Institutions or HEIs after the K to 12 BEC was signed into law. This study aimed to develop a module in Biological Science proposed for use by college freshmen in the Philippines, and measure the level of its content validity. Using an updated syllabus, questionnaire-checklist and feedback report sheet, a 294-page-16-chaptered Module in Biological Science was written and revised by the researcher, and was content validated by eight (8) experts in the field of Science from various HEIs and DepEd, including a book publisher for the module's lay-out and graphics. Data revealed that the respondents were not using any module in teaching Biological Science, and materials that served as alternatives were being used merely occasionally. Further, while data revealed that the respondents were generally satisfied with existing instructional materials or EIMs used in teaching Biological Science, they are moderately satisfied with the EIMs' graphical presentation and evaluation activities. Furthermore, the content-evaluators generally rated the proposed module in Biological Science as 'Very Highly Valid' in all aspects, namely: objectives, content, sequence, graphical presentation, evaluation activities, and consistency. With these findings, the researcher concludes that the proposed module in Biological Science can be used as main or supplementary material in teaching College Biology. The researcher recommends continuous validation of the 16-page Module in Biological Science once the Commission on Higher Education has designed the new curriculum for the subject since the implementation of the K to 12 BEC has installed change in the curricula presently in use.

Keywords – College, Biological Science, Module, Higher Education, Content Validity

INTRODUCTION

According to Donnelly and Fitzmaurice (2005), during the past fifty years, third level education has expanded and diversified and the demands and expectations being placed on Higher Education Institutions are now formidable, with changes in the student body and increased pressure from government on costs, procedures and results. Among academic staff, there are increased pressures through increased teaching loads, growing reporting, administrative requirements and pressure to develop and strengthen their research profile. According to McInnis (2000), surveys among academic staff consistently report that teaching is a source of reward but they also point out that they are working longer hours and dealing with a more diverse student group. Nonetheless, McInnis clarified that they still wish to improve and innovate their practice by designing and delivering effective courses and modules.

The increase size and diversity of the student group has impacted on the process of course design. A year before McInnis reported his findings, Biggs had already offered valuable suggestions for course design

strategies in the context of a growing student population. And, in 2002, Knight argued that courses in higher

education should be designed in order to maximize the chance that learners will experience coherence, progression and deep learning. To support this end, Barnett et al (2004) have had an argument that the curriculum received scant regard in current debates about teaching and learning in higher education but this may change in the context of quality assurance mechanisms and benchmarking. In fact, Knight (2002) claimed that material on design work for teacher planning programs in higher education is insubstantial. He further suggested that there is a need for advice on program design and argued for texts to be developed to target national markets.

Educators as catalysts for social transformations are entrusted to be more responsive to students' needs in the complex, technological society of today. Institutions of higher learning are experiencing massive curricular reforms not only to meet the demands of the immediate society but also to produce graduates who are globally competitive. But, it will be difficult to improve the teaching-learning process if teachers teach the way they



were taught but not the way the subjects should be taught (Calaunan, 2004).

Thus, there emerges the need for instructional systems which can make higher education available to large number of students, and, at the same time, offer an individualized learning experience. Hence, Modular Instruction, or MI. Present evidence suggests that MI meets the needs of today's students to the more adequately than traditional instruction both with respect to the quality of learning and the content. Given its emphasis on individualized learning and its adaptability to large number of students, MI has emerged as one of the most promising alternatives in higher education today (<http://link.springer.com/article>).

OBJECTIVES OF THE STUDY

This study aimed to develop a module in Biological Science proposed for use by college freshmen in the Philippines, and measure the level of its content validity.

Specifically, this research aimed to answer the following questions:

1. What is the status of the Existing Instructional Materials, or EIMs being used in the teaching of Biological Science for college students in the Philippines?
2. To what extent do EIMs in Biological Science meet the requirements for the course in terms of:
 - a. objectives,
 - b. content,
 - c. sequence,
 - d. graphical presentation,
 - e. evaluation activities, and
 - f. consistency?
3. What module in Biological Science may be proposed for use by college freshmen in the Philippines?
4. What is the content validity of the proposed module in terms of:
 - a. objectives,
 - b. content,
 - c. sequence,
 - d. graphical presentation,
 - e. evaluation activities, and
 - f. consistency?

MATERIALS AND METHODS

This study employed the descriptive-status of research since the status of existing instructional materials was assessed. It also employed the

development method of research since an output which was a module was developed. The questionnaire technique was employed to gather data from which the preparation of the module was based.

The content validators of the study were faculty who were handling or who have taught Biological Science, and have at least written and/or published an instructional material in Science at least for instructional use, and who have degrees in Biology or other allied field. The content validators are affiliated with the following agencies: College of Social Sciences, Department of Natural Sciences, College of Medical Technology, and College of Arts and Sciences of the University of Pangasinan – PHINMA; Research and Development Office of Lyceum Northwestern University – Dagupan Campus, Graduate School of Pangasinan State University – Urdaneta Campus, Department of Education Dagupan City, and Space Browser Publishing.

A questionnaire-checklist and a feedback report sheets, validated by experts in the field, were used to collect data. They were personally administered to the respective validators during the second semester of School Year 2013-2014. Data were subjected to statistical analysis.

The syllabus used as pattern in writing the modules was a collaboration of Biology instructors and was obtained from the Department of Natural Sciences where the researcher is presently a college instructor teaching Chemistry and Physics, alongside Biology.

RESULTS AND DISCUSSION

Status of EIMs in Biological Science

Data revealed that majority of the evaluator-respondents are not using modules in teaching Biological Science. Those who are using modules in teaching are only utilizing it occasionally. Further, data showed that those who are not using a module in teaching are utilizing various materials like textbooks (50.00%), books (16.67%), mimeographed materials (16.67%), and instructional software (16.67%).

The data clearly showed that modules were not generally used in higher education institutions or HEIs. This finding directly supported the objective of this study to develop and validate a module for use in teaching Biological Science as a subject. The need for the study was further strengthened when it was found that the frequency of use of modules among the users was merely occasional suggesting that the modules presently



available did not fit what they wanted or for any other reason.

Assessment on EIMs in Biological Science

Table 1 shows that, generally, the Existing Instructional Materials used in the teaching of Biological Sciences are rated with a weighted mean of 3.31 and is interpreted as 'Satisfactory.' This means that that evaluator-respondents are generally 'Satisfied' with the instructional materials that they are using in teaching Biological Science.

Further, the table reports a 'Highly Satisfactory' rating on existing instructional materials in terms of objectives ($M=3.72$) and content ($M=4.14$). This means that the evaluator-respondents are 'Highly Satisfied' on the objectives and contents of the EIMs. It can be inferred that these EIMs meet the main criteria for book selection, i.e. parallel objectives and content.

Furthermore, the table shows a 'Satisfactory' rating on existing instructional materials in terms of sequence ($M=3.48$) and consistency ($M=3.34$). This means that the evaluator-respondents are 'Satisfied', at least, to how the modules are sequence and for the consistency of the modules.

Finally, the table reports a 'Moderately Satisfactory' rating on existing instructional materials in terms of graphical presentation ($M=2.90$) and evaluation activities ($M=2.30$). This means that the evaluator-respondents are only 'Moderately Satisfied' on the graphics and the tests and other evaluative tools in the existing instructional materials.

The Proposed Module: Preface and Contents

The contains the following Preface:

'Biology: A Modular Approach' is a reference to non-science majors as a fit introduction and first encounter to the biological sciences. Science majors may also find this reference a refresher on the essentials of the course. This reference is primarily designed for a college freshman who needs to view life in a bigger perspective, yet he does not know that he needs it.

This reference has 16 modules with 294 pages. Two modules deal on the basics of science and biology, 4 modules on cellular structures, 3 modules on cellular functions, 1 module on heredity and evolution, 4 modules on diversity of bacteria, fungi, protists, plants, animals, and viruses, and finally, 2 modules on ecology. The modules proceed from the simplest to complex lessons.

Each module is designed to be user-friendly. It typically has an introduction that is 'bridging' the gap

between what you know already to what you are to learn more. Each module has a pre-test and a post-test with multiple choice questions that are 'solely' derived from the contents of the module. After each post-test, several enrichment activities are found like Word hunt, Sudoku puzzle, Flashback, Transfer, Application, a 5-minute non-stop writing activity, and scaffolding. All of these are meant to cater to multiple intelligences and individual differences.

Each module is divided into lessons. On average, each module has 3 lessons with at least 8 manageable pages. Pictures may be of two kinds which you may notice as you go along. Some pictures are meant to reinforce what is taught in the lessons. While some pictures may just provide you something funny yet educational about the lesson to get you interested in reading. Tables are also used to summarize some concepts discussed.

My hope for you, my dear students, is to find Biology as an exciting course as I found it when I was like you. I tried so hard to choose and realign the lessons in this reference to national standards. Brief yet concise, as we hope it will serve its purpose. I am confident that you are on the right track.'

The Proposed Module is outlined as:

- Module 1: Science and Its Methods
- Module 2: Basics of Biology
- Module 3: The Protoplasm
- Module 4: Cell Theory and Cell Diversity
- Module 5: The Plasma Membrane and Cellular Transport
- Module 6: Cell Organelles: Structure and Function
- Module 7: Energy, Metabolism, and Enzyme Activity
- Module 8: Cellular Respiration and Photosynthesis
- Module 9: Cell Cycle, DNA Replication,
and Protein Synthesis
- Module 10: Heredity and Evolution
- Module 11: Bacteria and Viruses
- Module 12: Protists and Fungi
- Module 13: Plants: Form and Structure
- Module 14: Animal Evolutionary Trends and Diversity
- Module 15: Basic Concepts of an Ecosystem
- Module 16: The Human Population

Table 1. Assessment on Existing Instructional Materials or EIMs in Teaching Biological Sciences

<i>Assessment Items</i>	<i>WM</i>	<i>DR</i>
Objectives		
1. The objectives measure the fundamentals of the course	4.63	VHS
2. The objectives are SMART.	4.00	HS
3. The objectives provide self-pacing.	2.13	MS
4. The objectives emphasize the most important concepts in the course.	4.13	HS
<i>Sub-mean</i>	3.72	HS
Content		
1. The IM contains all basic concepts in Biological Science.	4.25	VHS
2. The topics are meaningful.	4.25	VHS
3. The topics are useful.	4.50	VHS
4. The topics are interesting.	4.75	VHS
5. The content uses a language level appropriate for college freshmen.	3.00	S
6. The content reflects the course objectives.	4.38	VHS
7. The content meets the basic needs in Biology for students.	3.88	HS
<i>Sub-mean</i>	4.14	HS
Sequence		
1. The chapters are arranged from simple to complex.	3.63	S
2. The lessons are chronologically arranged.	3.75	S
3. The sequencing leads students to a better understanding of the content.	3.38	S
4. The sequencing permits self-pacing.	3.25	S
5. The sequencing encourages further reading the succeeding IMs.	3.38	S
<i>Sub-mean</i>	3.48	S
Graphical Presentation		
1. The IM contains comprehension aids like pictures, tables and the like.	3.00	S
2. Pictures reinforce concepts to be learned.	3.00	S
3. The comprehension aids are vivid.	3.00	S
4. The comprehension aids are gender-free.	3.25	S
5. The comprehension aids are in Philippine context.	2.25	MS
<i>Sub-mean</i>	2.90	MS
Evaluation Activities		
1. The IMs include a pre-test and a post-test.	2.25	MS
2. The evaluation activities are parallel to the objectives of the course.	3.00	S
3. The evaluation activities are varied and appropriate for college freshmen.	2.38	MS
4. The evaluation activities develop students' critical thinking skills.	2.38	MS
5. Questions are arranged from simple to complex.	2.00	MS
6. The evaluation activities provide for self-pacing and feedback.	2.13	MS
7. The activities cater to individual differences and Multiple Intelligences.	2.00	MS
<i>Sub-mean</i>	2.30	MS
Consistency		
1. The features of the IMs are the same throughout all the other modules.	3.88	S
2. The lay-out of the IMs is the same throughout all the other modules.	3.88	S
3. The arrangement of the feature is inviting.	2.63	MS
4. The IMs exhibit consistency.	3.00	S
<i>Sub-mean</i>	3.34	S
AVERAGE WEIGHTED MEAN	3.31	S

*Legend: VHS (Very Highly Satisfactory); HS (Highly Satisfactory); S (Satisfactory);
MS (Moderately Satisfactory); NS (Not Satisfactory)*

Table 2. Content Validity of the Proposed Module in Biological Sciences

<i>Assessment Items</i>	<i>WM</i>	<i>DR</i>
Objectives		
1. The objectives measure the fundamentals of the course	4.88	VHV
2. The objectives are SMART.	4.88	VHV
3. The objectives provide self-pacing.	4.88	VHV
4. The objectives emphasize the most important concepts in the course.	4.88	VHV
<i>Sub-mean</i>	4.88	VHV
Content		
1. The Module contains all basic concepts in Biological Science.	4.75	VHV
2. The topics are meaningful.	5.00	VHV
3. The topics are useful.	5.00	VHV
4. The topics are interesting.	5.00	VHV
5. The content uses a language level appropriate for college freshmen.	4.75	VHV
6. The content reflects the course objectives.	5.00	VHV
7. The content meets the basic needs in Biology for students.	5.00	VHV
<i>Sub-mean</i>	4.93	VHV
Sequence		
1. The chapters are arranged from simple to complex.	5.00	VHV
2. The lessons are chronologically arranged.	5.00	VHV
3. The sequencing leads students to a better understanding of the content.	5.00	VHV
4. The sequencing permits self-pacing.	4.88	VHV
5. The sequencing encourages further reading the succeeding IMs.	4.75	VHV
<i>Sub-mean</i>	4.93	VHV
Graphical Presentation		
1. The Module contains comprehension aids like pictures, tables and the like.	4.75	VHV
2. Pictures reinforce concepts to be learned.	4.75	VHV
3. The comprehension aids are vivid.	4.63	VHV
4. The comprehension aids are gender-free.	5.00	VHV
5. The comprehension aids are in Philippine context.	4.25	VHV
<i>Sub-mean</i>	4.68	VHV
Evaluation Activities		
1. The Module includes a pre-test and a post-test.	5.00	VHV
2. The evaluation activities are parallel to the objectives of the course.	4.88	VHV
3. The evaluation activities are varied and appropriate for college freshmen.	4.63	VHV
4. The evaluation activities develop students' critical thinking skills.	4.88	VHV
5. Questions are arranged from simple to complex.	4.88	VHV
6. The evaluation activities provide for self-pacing and feedback.	4.63	VHV
7. The activities cater to individual differences and Multiple Intelligences.	4.63	VHV
8. The activities enhance the students' Higher-Order-Thinking-Skills	4.89	VHV
<i>Sub-mean</i>	4.80	VHV
Consistency		
1. The features of the Module are the same throughout all the other modules.	5.00	VHV
2. The lay-out of the IMs is the same throughout all the other modules.	5.00	VHV
3. The arrangement of the feature is inviting.	4.88	VHV
4. The Module exhibit consistency.	5.00	VHV
<i>Sub-mean</i>	4.97	VHV
AVERAGE WEIGHTED MEAN	4.86	VHV

Legend: VHV (Very Highly Valid); HV (Highly Valid); V (Valid);



MV (Moderately Valid); NV (Not Valid)

Content Validity of the Proposed Module

Table 2 shows that, generally, the Proposed Module for Biological Sciences is rated with a weighted mean of 4.96 and is interpreted as 'Very Highly Valid'.

Very surprisingly, the eight (8) evaluators from various institutions rated all the 16 modules of the proposed module as 'Very Highly Valid' in terms of objectives ($M=4.88$), content ($M=4.93$), sequence ($M=4.93$), graphical presentation ($M=4.68$), evaluation activities ($M=4.80$), and consistency ($M=4.97$). Undoubtedly, the validity of the proposed module is 'Very High'.

CONCLUSION AND RECOMMENDATION

The researcher concludes that the respondents are not using instructional modules in the teaching of Biological Sciences, but are using alternatives like textbooks, books, mimeographed materials, and instructional software – which are being utilized merely occasionally. The respondents are generally 'Satisfied' with existing instructional materials that serve as alternatives with no modules are available for use. The Proposed Module was rated 'Very Highly Valid' in all of its aspects, namely: objectives, content, sequence, graphical presentation, evaluation activities, and consistency. Therefore, it meets the needs of the course in Biological Science.

The researcher recommends continuous validation of the 16-page Module in Biological Science once the Commission on Higher Education has designed the new curriculum for the subject since the implementation of the K to 12 BEC has installed change in the curricula presently in use.

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REFERENCES

- Barnett, R., Parry, G. and Coate, K. (2004) Conceptualising Curriculum Change, In M. Tight (Ed.) The RoutledgeFalmer Reader in Higher Education. London: RoutledgeFalmer.
- Calauan, C. (2004). Instructional Model in Philippine History, Unpublished Masteral Thesis, University of Pangasinan PHINMA
- Camara, J. S. (2012). Introduction to Biology. Jimczyville publications: Manila.
- CHED Memorandum Order No. 24, s. 2005. Retrieved from [www.ched.gov.ph]
- Donnelly, R. & M. Fitzmaurice. (2005). Designing Modules for Learning. Retrieved at [<https://arrow.dit.ie/cgi/viewcontent.cgi?article=1004&context=ltebk>, 10 May 2014]
- Knight, P.T. (2002) Being a Teacher in Higher Education. Buckingham: SRHE/OU Press.
- McInnis, C. (2000) Changing academic work roles: the everyday realities challenging quality in teaching, Quality in Higher Education, 6(2): 143-152.