BIBLIOGRAPHY

PINKIHAN, NORA K. APRIL 2008. Evaluation of Laboratory Manuals Produced by Teachers in Selected Basic Agricultural Courses in the College of Agriculture. Benguet State University, La Trinidad, Benguet

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ABSTRACT

This study was conducted to evaluate the laboratory manuals produced by teachers in the College of Agriculture of Benguet State University. It was conducted from October 2007 to January 2008.

To determine the comprehensibility, attractiveness, accuracy of the manual, and the effects of the manual to the mode of learning of the students, data were obtained from the students thru survey questionnaire as well as from interviews with experts on the subjects concerned.

Results revealed that the laboratory manuals were difficult to understand where in the students need assistance of teachers, fairly attractive but lack in graphics, accurate but lack citation of reference, and moderately effective in terms of use as reference, as reviewer, as guide during lecture, and as information source in each specific topic.

It is recommended that producers should use simpler words and sentences, add more graphics, combine classroom discussion and laboratory activities, and should cite references.

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INTRODUCTION

Rationale

No matter what the vocation is, instructional materials are an important part of our quest for knowledge and understanding. Instructional materials are essential tool for the initial training and continuing education of learners, youth and adults alike.

As one of the colleges of Benguet State University, the College of Agriculture produces instructional and laboratory manuals that are hoped to aid students in their studies. As a Center of Excellence in Agriculture Education, it has to provide quality instructional materials to enhance and develop students' capabilities, thereby facilitating academic excellence.

Instructional manuals help students in learning whether it contain classroom, laboratory or field–based applications of scientific and technological themes in each course. Cadiz (1991) stated that manuals are the most comprehensive "how-to" publications. They are useful in showing and explaining procedures or "how-to" topics, especially when properly illustrated with drawings and pictures to show ideas more concretely and clearly. The College of Agriculture is producing laboratory manuals in the subjects Entomology 11, Plant Pathology 11, and Soil Science 11. However, these laboratory manuals have not been evaluated; hence, there is a need for this study in order to check that these scholarly works have attained their objectives. This study is guided by the tenet that evaluation must be built in any communication activity if communicators want to determine how effective their efforts are. Clearly, the laboratory

manuals are mediums of communication that are aimed at enhancing the teaching-learning process.

In various studies, it has been found that graphics, lay-out and typography affect the attractiveness and comprehensibility of a reading material, and the readability along with the content and design may affect learning. In this case, the researcher would like to determine the comprehensibility and attractiveness of the manuals as perceived by the intended users, the accuracy of the manual, and how it was able to affect the students' learning.

Statement of the Problem

This study answered the following questions:

1. Are the manuals comprehensible?
2. Are the manuals attractive?
3. Are the content of the manuals accurate?
4. How did the manuals affect the learning of the students?

Objectives of the Study

1. To determine the comprehensibility level of the manuals.
2. To determine the attractiveness level of the manuals.
3. To determine the accuracy of the manuals.
4. To determine the effects of the manual to the learning of the students.

Importance of the Study

This study will serve as a reference and guide in making instructional manuals. The results may become the basis for future planning and production of teaching aids. It will give idea to producers for improvement.

Scope and Limitations

Data gathering for the study was on December 2007 to January 2008. The respondents were College of Agriculture 3rd and 4th year students who took up the basic subjects such as Entomology 11, Plant Pathology 11 and Soil Science 11.Key informants were selected to evaluate the accuracy of the manuals.

The study covered laboratory manuals produced by CA teachers for Entomology 11, Plant Pathology 11 and Soil Science 11 laboratory. The study focused only on the manuals as print materials and not in the context of how they were used in the classes.

REVIEW OF LITERATURE

Comprehensibility

Comprehension is dependent on two important cognitive abilities - understanding of language and understanding of event sequences (Richards et al., 2004).

In the study of Hung and Hsien (2007), it was stated that the learners further reported that they were not used to long texts and that they either lost patience or their eyes easily tired from reading online. Comprehensibility dropped as they increasingly struggled toward the end of the texts. Possibly, instead of using extensive reading strategies, such as contextual guessing, the participants immediately sought help whenever they stumbled across words they did not understand. Another explanation is that learners' comprehension difficulty might derive from sources other than vocabulary, such as complicated sentence patterns, their limited ability to grasp main ideas or the different contexts and idiomatic nature of familiar words.

Moreover, Readability and understandability are not synonymous; it is possible to make use of computerized readability scales and still have a consent form that is difficult to understand. Sometimes, reducing reading level without providing additional explanatory aids can lead to vagueness and oversimplification of scientific information, which is undesirable (NIH, n.d).

In order to easily comprehend a word, it should be spelled correctly. According to Ehri (2008), when a child struggles with spelling, his writing is much slower than his thinking. This makes it hard for him to clearly express his knowledge and ideas in written school assignments. Spelling is especially difficult for students with learning disabilities

(LD), so it is important that schools provide explicit, systematic spelling instruction on a regular basis throughout elementary school for these students.

Appropriateness of Words

To date most dictionaries merely explain the meanings of words. However, they neither tell users enough about the associations of a word to other word(s), nor do they provide enough information of the way words combine in a grammatical framework. Although thesauri provide synonyms and related words in groups of word sense, they are limited in that users cannot search words for use in a broad grammatical context. If one looks up synonyms in a thesaurus, she/he may find some words as alternatives. A corpus holds sets of substitutes of words appropriate in specific grammatical frameworks.To a learner of English as a second or foreign language, a word combinatory dictionary offers an unusual support for the writing of articles that sound more like a native speaker's writing, because the word combinatory dictionary will help writers check and learn the appropriateness of words used in combination (Qiao, 1997).

To have a good manual, appropriate topics are needed. A good way of identifying potential topics for your manual, particularly for policy manuals, is to look at manuals developed by other organizations. Many organizations have placed their manuals on their Internet site. Try searching on the general topic of your manual and see what you can find. If you don't find what you're looking for using one search engine, try another. See if the topics they've covered would be appropriate for your manual. Use their manual to stimulate your thinking (Hunter,n.d).

Instructional Materials

Instructional materials play a key role in the changes that move toward inquiry-centered, standard-based instruction. In 2004, North Thurston School implemented Policy 2311; Selection and Adoption of Instructional Materials which states that the instructional materials used to support the curriculum of the District serve as valuable resources to promote student learning and quality teaching. Instructional materials are selected to assist students in attaining the essential academic learning requirements and the grade level expectation as required by the State and the District.

They also defined instructional materials as the print or non-print materials used by students as the principal learning resource to meet the learning standards of a course or curriculum area shall be considered core materials. These may include textbooks, multimedia, non-print materials and computer softwares. Core materials constitute predominant mode of instruction or are materials that all students in the course are required to use. It is used by the students within a specific school building to meet learning standards of a course or curriculum that support, enrich, and individualize core materials are considered supplemental materials (NTS, 2004).

Importance of Manuals

Angligen (2006) cited in her thesis entitled “Source Analysis of Instructional Manuals Produced by College Teachers of Benguet State University” that Cadiz defined educational media as objects or devices, which are used to support the process of education whereby teachers or communicators attempt to, induce learning in students or an audience. These are also called instructional materials, supplementary teaching aids or teaching

devices. Instructional materials may be classified according to their form, thus there are printed materials like textbooks, audio-visual materials like films and community resources like observation. She also mentioned that the most common used instructional materials in college are manual.

Manuals are works containing concise background information and directions for activities, including conducting experiments or diagnostic tests in the laboratory. Also, laboratory manuals contain descriptions of standard laboratory procedures, current techniques and safety measures, as well as formulae and other technical information (NLM, n.d).

According to M. Cadiz and her research mate, manuals are the most comprehensive "how-to" publication. It is useful in showing and explaining procedures or "how-to" topics, especially when properly illustrated with drawings and pictures to show ideas more concretely and clearly. Self-Instructional Materials (SIM) performs the functions of a teacher, providing guidance, motivation, questioning and feedback (Sharma and Garg).

The importance of manuals certainly extends beyond their use in training and reference. In some sense (whether this is explicit or implicit) a user must ‘know’ what they are doing to use a system, and the manual is a representation of what they could know. With the increasing diversity of students in general education classes, teachers are seeking simple methods to teach all of their students while maintaining the reliability of the course. Manuals are an essential part of the system life cycle: from requirements and design, through usability, to acceptance. A user manual may provide instructions that, if the user follows them, achieve any of certain objectives as determined by the manual designers (Addison and Thimbleby, n.d).

Evaluating Instructional Materials

In instructional materials, the layout is important. Ellington and Earl (n.d.) explained it is an advantage to divide the content into clearly-defined sections, and to use a systematic and logical labeling system to tell the reader what these sections are, and indicate material of different types . Layout is the design and formatting of a page for publication. Layout used to be done by manually laying the elements of a page in place and fixing them to the page with wax. Now, most layouts are done onscreen, using a computer program, and there may never be a hard copy of the page (Computer User, 1997).

Some factors may affect the reader's interest like the legibility. Zaluksuk (1988) stated that readability, interest and prior knowledge in the reader are equally important factors in comprehension and retention of information. Reading is directly influenced by contextual cues which include the use of personal pronouns, lay-out and design of the text, typography (use of highlighting and italics), the use of signal words (now, then, but, later). Readability formulas measure word length or frequency and sentence length.

In relation, Pikulski (n.d) stated that a more reasonable definition of readability that is in keeping with more recent research and theory is the level of ease or difficulty with which text material can be understood by a particular reader who is reading that text for a specific purpose. Readability is dependent upon many characteristics of a text and many characteristics of readers.

Reading text and graphics is a common issue in lighting design and practice. Legibility of text and graphics is often measured using the Legibility Index, conventionally defined as the distance at which material can be read with perfect accuracy (the legibility

distance) divided by the character height. The ratio equals to the inverse tangent of the visual angle *V*. This definition assumes the material to be read is perpendicular to the viewer, which is always not true. Off-axis viewing of text and graphics is common in reality, yet rarely researched (Cai and Green, n.d).

In addition, Addison & Thimbleby (n.d.) stated that manuals are often improved by using clear English, careful exposition, pictures and diagrams. It may be the case, however, that these are cosmetic improvements and the manual could be more significantly improved by addressing its structure. Certainly, achieving a good style would be compromised by changes in structure, but not the other way around. Thus getting a good structure is the primary task, after which refinements can be made.

Visual Design

Visual design is not just about making your application look pretty. Good visual design is about communication. A well-designed application will make it easy for the user to understand the information that is being presented, and show them clearly how they can interact with that information (Benson, 2002).

According to Bix, (2002), the major function of textual messages and graphic elements is communication. The graphic/text combination can evoke emotional responses or convey information for purposes as varied as motivating a sale to furthering a cause.

Typography is design and use of typefaces as a means of visual communication from calligraphy to the ever-developing use of digital type is the broad use of the term typography. However, the art and practice of typography began with the invention of moveable type and the printing press. Typography is sometimes seen as encompassing

many separate fields from the type designer who creates letterforms to the graphic designer who selects typefaces and arranges them on the page. It is sometimes seen as encompassing many separate fields from the type designer who creates letterforms to the graphic designer who selects typefaces and arranges them on the page. Typography includes text composition or the arrangement of type on the page. These are the tasks involved in text composition (Bear, 2008).

According to Webster Dictionary (n.d), graphics are product of graphic art. Graphic representations are pictures, map, or graph used for illustration. It is also pictorial image displayed on a computer screen**.** The art or science of drawing as representation of an object in two-dimensional surface according to mathematical rules of projection goes with statements of Wikipedia that graphics are visual presentations on some surface to brand, inform, illustrate, or entertain. Examples are photographs, drawings, Line Art, graphs, diagrams, typography, numbers, symbols, geometric designs, maps, engineering drawings, or other images. Graphics often combine text, illustration, and color.

Communication design is an essential aspect of communication today as exchange of information. Besides verbal communication, the modern person thinks in pictures. Text and pictures enhance the perception of information. The area of press and publishing is the visual design of the media, as for example the print media, with its magazines, books and general publications. Included also is design for AV media. Here techniques are used from every area of design, from typography to photography and video. The area of aids for teaching, learning and information involves presentation of information for scientists and lay people, from textbooks to visual teaching aids (Hochschule Mannheim, 2004).

Meanwhile, Information design is the discipline of developing structures which allow people to find information that's relevant to them, and use it to make decisions which enhance their lives (Gray, 2005).

Importance of Citation

According to Hunter (n.d.), citation is important because it is the basis of academics, that is, the pursuit of knowledge. In the academic endeavor, individuals look at evidence and reason about that evidence in their own individual ways. That is, taking what is already known, established, or thought, they use their reasoning power to create new knowledge. In creating this knowledge, they must cite their sources accurately for three main reasons: First, citing sources is important because the currency of academia is ideas. As a result, academics want to accumulate that currency; they want to get credit for their contributions. When a writer cites ideas, that writer honors those who initiated the ideas. Second, keeping track of sources is important because, if you use someone else's idea without giving credit, you violate that person's ownership of the idea. Third, keeping track of sources is important because academics value being able to trace the way ideas develop.

If another person reads one of the "second generation" ideas, proper citation will allow that person to explore the original publication to trace the way the idea has developed. In general, scholars must be able to trace how ideas develop in order to consider, think about, and test them accurately. So, giving credit to the original source of ideas is the right thing to do, as well as the basis on which academia is built.

METHODOLOGY

Locale and Time of the Study

The study was done in the College of Agriculture. The College of Agriculture is located at Benguet State University, KM 6 La Trinidad, Benguet. It is in between the College of Arts and Sciences Annex and College of Teacher Education. Figure 1 shows the map of the locale of the study.

The university, in order to attain its objectives focuses its endeavors on instruction, research, extension and production. The College of Agriculture continuously produces excellent students based on the awards and recorded numbers of graduated students with honors and scholastic achievements. In 2003 it was declared as a Center of Excellence in Agriculture by the Commission on Higher Education. Under it, Bachelor of Science in Agriculture (BSA) and Bachelor of Science in Agribusiness (BSAB passed the Level III accreditation of the Accrediting Agency of Chartered College and Universities in the Philippines (AACCUP) in November 2007 and February 2008, respectively.

The study was done from December 2007 to January 2008.

Respondents of the Study

The respondents of the study were a mixture of 3rd and 4th year students from Bachelor of Science in Development Communication (BSDC), Bachelor of Science in Agriculture (BSA), and Bachelor of Science in Agribusiness (BSAB) who recently finished Soil Science 11, Entomology 11 and Plant Pathology 11. Fifty (50) respondents were taken from the total population of the students who finished the basic subjects from

school year 2006 to 2007. The respondents were chosen through simple random sampling.

Out of 50 respondents, there were 27 (54%) male and 23 (46%) female. Most (94%) of the respondents were at the age bracket of 19 to 20 years old. For Entomology 11, 7 (14%) of the respondents took the subject during the first semester and 43 (86%) took it during the second semester; for PP 11, 44 (88%) during the second semester; and for SS 11, 44 (88%) during the first semester and 6(12%) during the second semester. Only 6 (12%) of the respondents took Plant Pathology 11 during the first semester of school year 2007-2008.

For both BSA and BSAB students, all three courses are offered during their second year. For BSA students, PP 11 and Entomology 11 are regularly offered during the second semester while SS 11 is offered regularly during the first semester. For BSAB students, Entomology 11 is offered only in the second semester while PP 11 and SS 11 are offered during the second semester. BSDC students have these subjects during their third and fourth years. Entomology 11 is during the first semester and SS 11 in the second semester of third years, while PP 11 during the first semester of the fourth years.

Key Informants were asked to evaluate the accuracy of the manuals. All the key informants are from the Benguet State University who are researchers and faculty members of whom 5 were male and 4 were female. There were three key informants in each major field. For Plant Pathology, the key informants finished their Masters degree and have been in the university for more than ten years (i.e. 20 to 25 years). For Entomology and Soil Science, key informants have finished their Bachelors degree and are currently taking their Masters degree. They have been with the university as either researchers or teachers for less than 10 years.

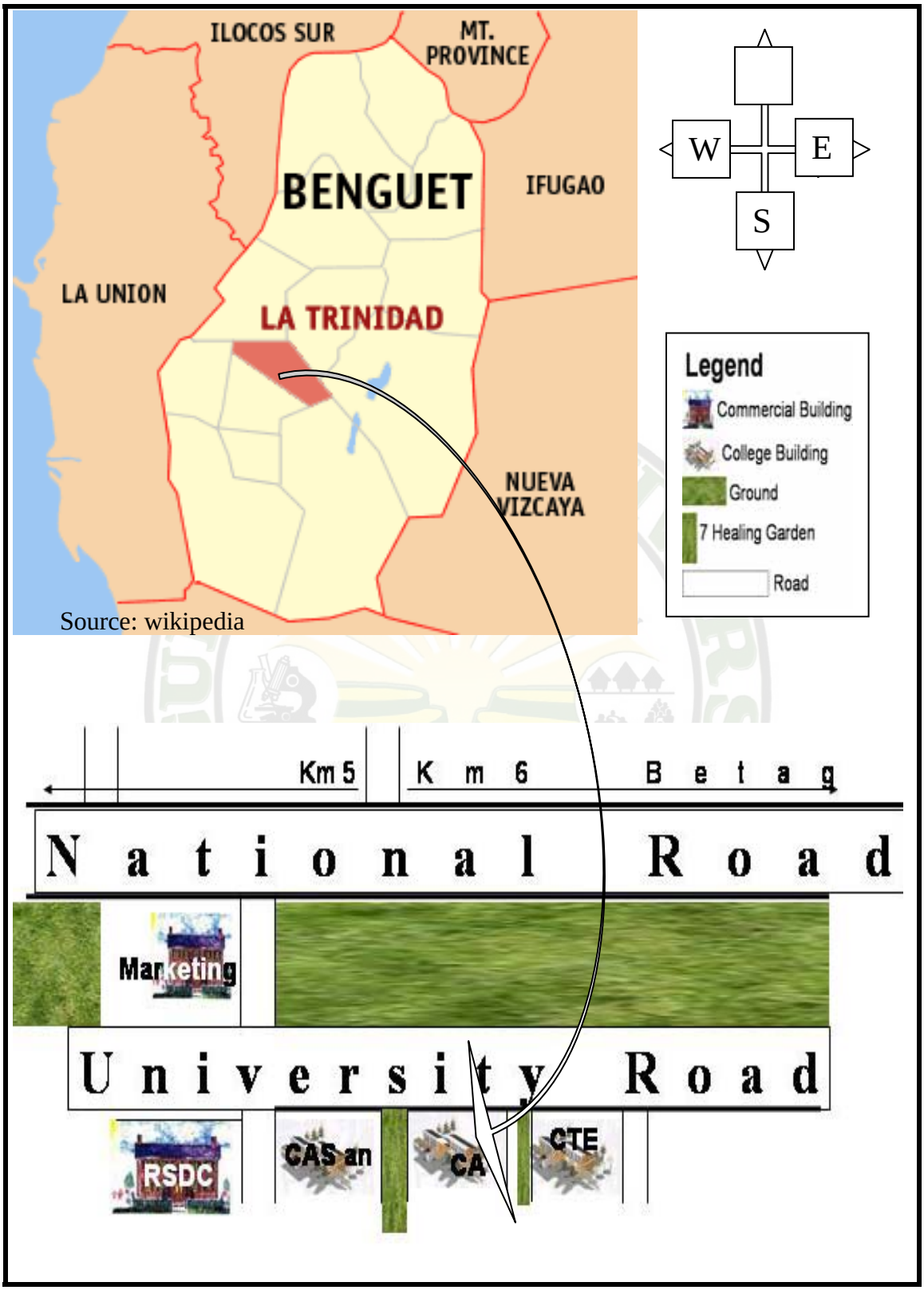

FIGURE 1. Map of Benguet and partial part of BSU showing the locale of the study.

Data Collection

The data were collected through survey questionnaire which was floated to the students. Students evaluated the manual according to its comprehensibility and attractiveness. They were also asked to evaluate how the manual was able to help them in their study of the subjects. The researcher further referred to students' laboratory grades to check the effect of the manuals on their understanding of the subject.

Key informants were asked to check the accuracy of the content of the manual. The key informants were chosen depending on their field.

Readability of the manuals was further evaluated using the Gunning's Fog Index.

Data Gathered

The data were comprehensibility level, attractiveness level, and effects of the manuals to the learning of the students. Data on accuracy were derived from the answers of the key informants.

Data Analysis

The data were tabulated, consolidated, categorized and interpreted according to the objectives of the study. The data was analyzed thru getting the mean and relative rating

RESULTS AND DISCUSSION

The Manuals

The Plant Pathology 11 and Entomology 11 manuals are of the same size (short bond paper/8.5" x 11"), soft bound, and with a green, hard paper for cover. The Entomology 11 manual is smaller in size (6" x 8.2") and is covered with white, hard, glossy paper. The structure of each manual is almost the same wherein they contain an introductory discussion to each chapter, the learning objectives, the activities required of the students, the formulas needed and some graphics to illustrate some of the concepts.

Angligen (2006) described in her study the characteristics of instructional manual developers of BSU to which the authors of these manuals under the study are part of. She said that half of the faculty members involved in manual development had doctorate degrees and 36 with master's degrees.

The three manuals included in this study are all a team effort. Most of the members of the faculty in each department concerned were involved in the production of the materials.

Comprehensibility of the Manuals

Tables 1, 2, and 3 show the comprehensibility of each manual. The respondents were given a rundown of the topics in each manual to refresh their memory and to check which parts of the manuals were easy or difficult to understand. The mean rate for the comprehensibility of chapter of each manual were taken and were interpreted: 1 to 1.99 is DU (Difficult to understand), from 2 t0 2.99 is NENDU (Neither Easy or Difficult to

Understand), and 3 is EU (Easy to Understand). The range for the total mean of each manual is different from each other because the manuals have different total number of topics. The Soil Science 11 manual has 11 chapters thus, the highest mean should be 33 for EU (Easy to Understand), 22 is NENDU (Neither Easy nor Difficult to Understand), and 11 is DU (Difficult to Understand). The Entomology 11 manual has 7 chapters thus, the highest mean should be 21, EU (Easy to Understand), 14 is NENDU (Neither Easy nor Difficult to Understand), and the lowest is 7 which would mean difficult to understand. The Plant Pathology 11 manual has 4 chapters where the highest mean should be 12 for EU (Easy to Understand), 8 for NENDU (Neither Easy nor Difficult to understand), and the lowest is 4 for DU (Difficult to Understand).

From the result of the study, the respondents claimed that Plant Pathology 11 (13.78) and Entomology 11 (7.64) laboratory manuals are difficult to understand, while the Soil Science 11 manual is (21.96) neither difficult nor easy to understand.

In the Soil Science 11 manual, Chapters 1 until 6 are neither easy nor difficult to understand, while respondents claimed that Chapters 7 to 11 are difficult to understand. For Entomology 11 manual, there are 3 chapters that are neither easy nor difficult to understand (Chapters 4, 5 and 7) while the rest are difficult to understand. For Plant Pathology 11 manual, chapters 2 and 3 are neither easy nor difficult to understand while Chapters 1 and 4 are difficult to understand.

Table 1. Comprehensibility of Soil Science 11 manual

CHAPTERS AND TOPICS	MEAN	COMPREHENSIBILITY LEVEL
1. The soil in perspective: the soil profile	2.16	NENDU
2. Collection and preparation of soil samples	2.4	NENDU
3. Soil-forming rocks and minerals	2.12	NENDU
4. Soil texture	2.24	NENDU
5. Soil structure, particle Density, Bulk density and Porosity	2.02	NENDU
6. Soil moisture	2.02	NENDU
7. Soil Colloids: their important Characteristics	1.78	DU
8. Cation exchange	1.76	DU
9. Soil reaction: Acidity and alkalinity-Their effects on nutrient Solubility and availability	1.88	DU
10. Organic Matter decomposition and carbon dioxide Evolution	1.82	DU
11. Interpretation of soil and topographic maps	1.76	DU
Total	21.96	NENDU

Legend for Soil Science 11 manual:

Mean per Chapter:
1 = DU (Difficult to understand)
2 = NENDU (Neither Easy Nor Difficult to Understand)
3 = EU (Easy to Understand)

Total of Mean:
11 = DU
22 = NENDU
33 = EU

Table 2. Comprehensibility of Entomology 11 manual

CHAPTER AND TOPICS	MEAN	COMPREHENSIBILITY LEVEL
1. Insect Metamorphosis	1.96	DU
2. Structure of Insect and Their Function	1.78	DU
3. Classification of Insect	1.98	DU
4. Insect Ecosystem	2.02	NENDU
5. Major Insect Pest of High Value Crops in the Philippines	2.02	NENDU
6. Insect Beneficial to Man	1.9	DU
7. Insecticide Screening	2.12	NENDU
Total	13.78	DU

Legend for Entomology 11:
Mean per Chapter:
1 = DU (Difficult to understand)
2 = NENDU (Neither Easy Nor Difficult to Understand)
3 = EU (Easy to Understand)

Total of Mean:
7 = DU
14= NENDU
21= EU

Table 3. Comprehensibility of Plant Pathology 11 manual

CHAPTER AND TOPICS	MEAN	COMPREHENSIBILITY LEVEL
1. Study of Plant Diseases Caused by Fungi	1.62	DU
2. Study of Plant Diseases Caused by Bacteria	2.04	NENDU
3. Study of Plant Diseases Caused by Nematodes	2.06	NENDU
4. Study of Plant Diseases caused by Viruses	1.92	DU
Total	7.64	DU

Legend for Plant Pathology 11:
Mean per Chapter:
1 = DU (Difficult to understand)
2 = NENDU (Neither Easy Nor Difficult to Understand)
3 = EU (Easy to Understand)

Total of Mean:
4= DU
8= NENDU
2= EU

Further, the respondents suggested that the producers should use simpler words and consequently simpler sentences. As Addison & Thimbleby (n.d) said, manuals are often improved by using clear English, careful exposition, pictures and diagrams. Zaluksuk (1988) also stated that readability, interest and prior knowledge in the reader are equally important factors in comprehension and retention of information. Readability is the level of ease or difficulty with which text material may be comprehended (Samuels, 1983) by a particular reader who is reading that text for a specific purpose.

It should be noted that people tune out any message that borders on the technical. A lot of the respondents said that the manuals contain a lot of technical terminologies which they do not encounter in their day to day dealing with other people. Technical language or "technical talk" is most commonly referred to as jargon. Jargon becomes a problem when it stops people understanding the message. When jargon is used (even if unintentionally) with audiences it is not intended for, people will find it difficult to understand. The ability to understand or comprehend simple verbal instructions or other work related dialogue is a necessary requirement in most workplaces across all industries (Mind Tools, 2005).

It was predetermined that readability has something to do with comprehensibility, thus the readability level of each manual was also derived.

The researcher selected paragraphs/texts in the introduction of each chapter in each manual. To facilitate this, the website www.onlineutility.org/english/readability_test was used. The selected paragraphs were inputted in the site and the site generated the results for the readability using the Gunning Fog Index formula. The indicators for the readability level based on the Gunning Fog Index are shown in Table 4.

Table 4. Indicators for the readability level based on the Gunning Fog Index

READING RANGE	FOG INDEX	GRADE LEVEL
Difficult	17	College graduate
	16	College senior
	15	College junior
	14	College sophomore
	13	College freshman
Fairly Easy	12	High school senior
	11	High school junior
	10	High school sophomore
	9	High school freshman
Easy	8	Eighth grade
	7	Seventh grade
	6	Sixth grade

Source: Lustria, 2001

Table 5 shows the sample on how the fog index is used. A chosen paragraph from Soil Science 11 in Chapter 1 is included to show how the fog index is used.

> "The science of soils is founded on various concepts and principles that evolved on the application of four basic sciences of chemistry, physics, biology and geology through decades of countless experimentation and practical testing. Soil science, therefore, is defined as a body of knowledge that has accumulated from the study of soils through the application of four basic sciences. Soil science composed of different divisions as follows: Soil Chemistry, Soil Physics, Soil Microbiology, Soil Fertility and Management, Soil Conservation and Management, Soil Taxonomy, Soil Genesis and Soil Survey and Classification."

Table 5. Sample on how the Fog Index was used

INDICATORS	NUMBERS
Number of characters (without spaces)	516.00
Number of words	90.00
Number of sentences	3.00
Average number of characters per word	5.73
Average number of syllables per word	1.93
Indication of the number of years of formal education that a person requires in order to easily understand the text on the first reading Gunning Fog index	21.78
Approximate representation of the U.S. grade level needed to comprehend the text Coleman Liau index	16.97
Flesh Kincaid Grade level	18.92
ARI (Automated Readability Index)	20.57
SMOG	19.43
Flesch Reading Ease	12.83

The laboratory manuals have a Fog Index that fall on the difficult reading range (Table 6) with 16.40 for Soil Science 11 manual, 15.01 for Plant Pathology 11 manual, and 13.06 for Entomology 11 manual. The manuals are difficult but should have been good enough for college students. The Soil Science 11 manual is good for a College senior, the Plant Pathology 11 manual for a college junior, and the Entomology 11 manual for a college freshman. By these observations, the Soil Science 11 manual is the most difficult

to understand, especially since Soil Science 11manual is being taken by BSA and BSAB students during their second year, and by BSDC students during their third year. Note that the respondents indicated that the manuals are neither difficult nor easy to understand indicating that they have average understanding of the discussions in the manual thus additional explanation from the teachers may be needed.

One of the major contributors to a good first impression is how easy your content is to read (Wilson, 2007). Readability may also be affected by factors that are internal (e.g. background experiences, knowledge base, and awareness of text structure) and external (e.g. text topic and structure, environmental characteristics, and the goal imposed on the reader by an external source) to a reader or learner (Greer, et al. 2003).

Table 6. Fog Index of each manual

MANUALS	FOG INDEX	READING RANGE	GRADE LEVEL
Soil science 11	16.40	Difficult	College senior
Plant Pathology 11	15.01	Difficult	College junior
Entomology 11	13.06	Difficult	College freshmen

Attractiveness of the Manuals

Data in Table 7 shows how the respondents aesthetically viewed the manual in terms of graphics used, font size and style, and layout. It is indicated that the manuals are fairly attractive. In terms of their graphics, Soil Science 11 and Plant Pathology 11 manuals are unattractive while Entomology 11 manual is fairly attractive. It was further

Table 7. Attractiveness level of each manual

ELEMENTS	BASIC AGRICULTURAL COURSES					
	SOIL SCIENCE 11		PLANT PATHOLOGY 11		ENTOMOLOGY 11	
	Mean	Level	Mean	Level	Mean	Level
Graphics	1.92	Unattractive	1.96	Unattractive	2.06	Fairly Attractive
Layout	2.36	Fairly Attractive	2.22	Fairly Attractive	2.14	Fairly Attractive
Font/ typography	2.78	Fairly Attractive	2.76	Fairly Attractive	2.62	Fairly Attractive
Over-all	7.06	Fairly Attractive	6.94	Fairly Attractive	6.82	Fairly Attractive

Legend:

Level of each Element:

1 = Unattractive

2 = Fairly Attractive

3= Very Attractive

Over-all:

3 = Unattractive

6 = Fairly Attractive

9 =Very Attractive

observed by the respondents that there wasn't enough graphics to illustrate some of the concepts and processes indicated in the manuals. All the manuals are fairly attractive as to their lay-out and font size and styles, concepts and processes indicated in the manuals. All the manuals are fairly attractive as to their lay-out and font size and styles.

Moreover, the respondents suggested that the producers should use more drawings and graphics to illustrate the topics and methods that are presented in the manuals. They should also make use of realistic photos so that they will be able to easily discern the examples given. Some respondents also mentioned about putting a better cover design on the manuals.

Borland, et al (1997) suggested the possibility that too much written information might be distracting and that photograph might supplement written text effectively. He cautioned however that the use of photographs in instructional media raises the issue of how many might be required for good performance. It is generally assumed that experience in visual detection tasks improves performance, at least up to some notional performance ceiling. This would suggest that the provision of more examples than only a couple would be advantageous.

As Benson (2002) said, visual design is not just about making your application look pretty. Good visual design is about communication. A well-designed application will make it easy for the user to understand the information that is being presented, and show them clearly how they can interact with that information. Moreover, Bix (2002) also stated that the major function of textual messages and graphic elements is communication. The graphic/text combination can evoke emotional responses or convey information for purposes as varied as motivating a sale to furthering a cause. Besides verbal

communication, the modern person thinks in pictures. Text and pictures enhance the perception of information. Here techniques are used from every area of design, from typography to photography and video. The area of aids for teaching, learning and information involves presentation of information for scientists and lay people, from textbooks to visual teaching aids (Hochschule Mannheim, 2004).

Table 8 shows the comments of the respondents on the comprehensibility and attractiveness of the respondents. The comments may help the producers in improving the laboratory manuals produced.

Table 8. Comments of respondents on the manuals according to the given criteria

CRITERIA	SOIL SCIENCE 11	ENTOMOLOGY 11	PLANT PATHOLOGY 11
Comprehensibility	Authors should use simpler words	Authors should use simpler words	Authors should use simpler words
Attractiveness			
Graphics	It lacks graphics. Add graphics	It lacks graphics. Put some graphics	It lacks graphic. Add graphics
Layout	Doesn't have cover graphics	-	-
Font	Readable	Readable	Readable

Accuracy of the Content of the Manuals

Key informants or experts in the field were further asked to check the accuracy of the manuals.

As shown in Table 9, the information written in all laboratory manuals under study are correctly spelled, defined and agrees with other print sources as well as with the informant's knowledge of the topics. Thus, in this regard, the manuals are accurate. Studies have shown that authors' exhibition of a clear understanding of good grammar adds credibility to any written information. Further, effectiveness of a communication medium or any visual design depends on the quality, relevance and integrity of the content (Rajamanickam, 2001).

However, according to the key informants, the authors of Entomology 11 and Plant Pathology 11 manual did not cite the sources and suggested references for the students. Citation of sources contributes to the credibility and reliability of the manuals. Credibility and reliability of the manual also adds to the accuracy of the manual. Suggested references may also help the students who don't understand certain topics in the manual. According to Hunter (n.d.), citation is important because it is the basis of academics, that is, the pursuit of knowledge. In the academic endeavor, individuals look at evidence and reason about that evidence in their own individual ways. That is, taking what is already known, established, or thought, they use their reasoning power to create new knowledge.

In the Entomology 11 laboratory manual, one of the key informants said that, the words Paurometabolous or Hemimetabolous used in the manual are not appropriate because the immature of Hemimetabolous is aquatic while the Paurometabolous is terrestrial. The term Hemimetabolous is inappropriate in the manual because it has immature that is aquatic which doesn't match with what the students are rearing and so to

correct the manual, it should be put as 'Hemimetabolous/Paurometabolous' to let the students choose on what they're going to rear. They only rear hemimetabolous metamorphosis insects.

Two of the informants said that the activities were appropriate. One of them however, said that there is an inappropriate activity in the Entomology 11 manual. She said that she has already called the attention of the Department Chairperson to the particular activity under the topic on Insecticide Screening and they have agreed that the activity will be changed in the next publication of the manual.

These comments from the key informants may help the producers to improve the manuals.

Table 9. Matrix of comments on the accuracy of the manuals

CRITERIA	BASIC AGRICULTURAL COURSES		
	SOIL SCIENCE 11	ENTOMOLOGY 11	PLANT PATHOLOGY 11
Spellings of words	Correctly spelled	Correctly spelled	Correctly spelled
Definition of words or topics	Correctly defined	Correctly defined	Correctly defined
Appropriateness of words	Appropriate	Paurometabolous/ Hemimetabolous	Appropriate
Appropriateness of topics	Appropriate	Appropriate	Appropriate
Appropriateness of activities	Appropriate	-	Appropriate
Citation of reference	-	Not present in the manual	Not present in the manual
Publication year	-	-	Not present in the

Effect of the Manuals to the Learning of the Respondents

Table 10 shows the effects of the manuals to the learning of the students. It is indicated that all the manuals are moderately effective. Mean of 1 to 1.99 is equivalent to NE (Not Effective), mean of 2 to 2.99 is ME (Moderately Effective), and mean of 3 is HE (Highly Effective). Basing from the answers of the students, the manuals are not that effective in helping the students in their performance and understanding of the course. It is also reflected in their laboratory grades that the manuals are slightly effective (shown in table 5).

All of the manuals are moderately effective as a reference, reviewer and information material. It was also moderately effective as a guide during lectures and in providing motivation to students.

Specifically, the Soil Science 11 laboratory manual is moderately effective since all the ratings are above 2; as a reference (2.34), as reviewer (2.5), as guide during lecture (2.54) as motivation (2.56) and as information material (2.40) since all the effects has mean of above 2. For the Plant pathology 11 manual, it is moderately effective as a reference (2.3), as reviewer (2.48), as guide during lecture (2.52) as motivation (2.52) and as information material (2.44). For Entomology 11 manual, it is moderately effective as a reference (2.32), as reviewer (2.42), as guide during lecture (2.38) as motivation (2.54) and as information material (2.44).

Table 11 shows the grades of the respondents that may also reflect the effect of the prepared laboratory manuals. Of the 50 respondents almost half of them got a good grade in PP 11 (42%) and SS 11 (46%) while half of them got fair grade (50%) in Entom 11. The respondents' laboratory grades reflect that the manuals are slightly effective. However, let us not discount that there were other factors that might have affected the laboratory grades of the respondents which were not involved in this study and that the researcher did not focus on these other factors.

Table 11. Performance of the respondents in each subject

GRADES	EQUIVALENT	PLANT PATHOLOGY 11		ENTOMOLOGY 11		SOIL SCIENCE 11	
		No (n=50)	%	No (n=50)	%	No (n=50)	%
1.0 to 1.25	Excellent	-	-	-	-	-	-
1.5 to 1.75	Very Good	2	4	3	6	6	12
2.0 to 2.25	Good	21	42	15	30	23	46
2.5 to 2.75	Fair	17	34	25	50	12	24
3.00	Passing	10	20	7	14	9	18
Total		50	100%	50	100%	50	100%

The manuals only contained a brief explanation or introduction to each topic. It was suggested that the producers should make it as instructional manual or a combination of instructional manual and laboratory manual to be more useful during reviewing and

not only during laboratory classes. According to M. Cadiz (1991), manuals are the most comprehensive "how-to" publication. It is useful in showing and explaining procedures or "how-to" topics, especially when properly illustrated with drawings and pictures to show ideas more concretely and clearly. She also defined educational media as objects or devices, which are used to support the process of education whereby teachers or communicators attempt to, induce learning in students or an audience. In addition, Self-Instructional Materials (SIM) performs the functions of a teacher, providing guidance, motivation, questioning and feedback (Sharma and Garg). In 2004, North Thurston School implemented Policy 2311, Selection and Adoption of Instructional Materials which imposes that instructional materials are selected to assist students in attaining the essential academic learning requirements and the grade level expectation as required by the State and the District. They also defined instructional materials as the print or non-print materials used by students as the principal learning resource to meet the learning standards of a course or curriculum area.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The study was conducted on October 2007 to January 2008 at the College of Agriculture. The respondents were fifty (50) 3rd and 4th year students of the College of Agriculture taking up Bachelor of Science in Development Communication (BSDC), Bachelor of Science in Agriculture (BSA), and Bachelor of Science in Agribusiness (BSAB) and who recently finished Soil Science 11, Entomology 11 and Plant Pathology 11. They were chosen through simple random sampling. Key informants were selected to evaluate the accuracy of the manuals. The study covered laboratory manuals produced by CA teachers for Entomology 11, Plant Pathology 11 and Soil Science 11 laboratory.

The data collected were on the comprehensibility of the manuals, attractiveness, accuracy of the manual, and the effects of the manual to the learning and performance of the students in the three subjects. Results of the study were interpreted using mean and relative rating.

Conclusions

Based on the results of the study, the following conclusions are drawn:

1. the manuals are difficult to understand, hence the students need assistance of the teachers to explain the discussion in the manuals;
2. the manuals are fairly attractive, however, the manuals lack illustrations and graphics that help the students to have a better understanding of the topics and methods in the activities written in the manual;
3. the manuals are accurate in terms of spellings, definitions, the chosen

topics and the words/terminologies used, but they should use simple words;

4. citation of references is not present in the manuals;
5. the manuals lack some information that could further aid the students in understanding the course; and
6. the manuals slightly helped the students in their performance in the subjects.

Recommendations

Based on the findings, the researcher forwards the following recommendations:

1. The producers should explain the principles (especially the highly technical concepts) using simpler words and sentences, the help of an editor may be sought for this purpose.
2. The producers should add more graphics and illustrations in the manual to explain more the topics and activities to help students to have a better understanding.
3. The producers should combine classroom discussion and laboratory activities in one manual so that it will help the students in reviewing the topics of the subjects. It will be a complete manual in terms of its contents or instructional manual that will help students and it will also help the teachers in explaining the lessons. However, the role of the teacher should not be totally disregarded.
4. The producers should cite the source of information used in the manuals to add credence and to include other materials for the students to refer to about the specific topics.

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Appendix A. Letter to Respondents

I. Letter to the respondents

Respondent No _____

Dear_____

Good day!

I am Nora K. Pinkihan, a senior BS Development Communication student from Benguet State University, La Trinidad, Benguet. I am currently conducting my undergraduate research entitled "EVALUATION OF LABORATORY MANUALS IN SELECTED BASIC AGRICULTURAL COURSES PRODUCED BY TEACHERS IN THE COLLEGE OF AGRICULTURE, BENGUET STATE UNIVERSITY"

In this connection, I will appreciate very much if you will answer this questionnaire. Rest assured that the information you will provide will be used solely in this study for academic research and for improvement of the manual.

I look forward to your favorable action on this request. Your cooperation will contribute a lot to the completion of my thesis.

Thank you very much!

Sincerely,

_____
Nora K. Pinkihan
Researcher

Noted by:

_____
Mrs. Marife D. Carpio
Research Adviser

II. Sample of letter to the key informants

Ins. Gemma Sabas
Department of Entomology
College of Agriculture
Benguet State University

Dear Madam:

Good day!

I am Nora K. Pinkihan, a senior BS Development Communication student from Benguet State University, La Trinidad, Benguet. I am currently conducting my undergraduate research entitled "EVALUATION OF LABORATORY MANUALS IN SELECTED BASIC AGRICULTURAL COURSES PRODUCED BY TEACHERS IN THE COLLEGE OF AGRICULTURE, BENGUET STATE UNIVERSITY".

In this connection, I will appreciate very much if you will answer this questionnaire. Rest assured that the information you will provide will be used solely in this study for academic research and for improvement of the manual.

I look forward to your favorable action on this request. Your cooperation will contribute a lot to the completion of my thesis.

Thank you very much!

Sincerely,

_____
Nora K. Pinkihan
Researcher

Noted by:

_____
Marife D. Carpio
Research Adviser

Appendix B. Sample of the Survey Questionnaire

Evaluation form of Entomology Manual

I. Socio-Demographic Profile

Name: _____ Age_____ Gender_____

Course _____ Major _____

II. Comprehensibility of the Manual

1. Please rate the content of the manual in terms of its degree of comprehensibility. Check the number that corresponds to your answer.

1. Difficult to understand
2. Neither easy nor difficult to understand
3. Easy to understand

Topics	3	2	1
1. Insect Metamorphosis			
2. Structure of Insect and Their Function			
3. Classification of Insect			
4. Insect Ecosystem			
5. Major Insect Pest of High Value Crops in the Philippines			
6. Insect Beneficial to Man			
7. Insecticide Screening			

2. What can you suggest to further improve the comprehensibility or understanding of the manual's content?

_____
_____

III. Attractiveness of the Manual

1. Are the photographs in the manual appealing to you?
_____ Yes _____ No _____ can't say

2. Do you like the charts and drawings used in this manual?
_____ Yes _____ No _____ can't say

3. Are the font sizes large enough to be read clearly?
_____ Yes _____ No _____ can't say

4. Is the font style pleasing to the eye?
_____ Yes _____ No _____ can't say

If you answered NO in a or b, what are your suggestions?

_____

5. Do you think that the cover, photographs, charts, and diagrams suit the topics in the manual?
_____ Yes _____ No _____ can't say

6. Is there unity or harmony in the layout used?
_____ Yes _____ No _____ can't say

7. Is/are there any visual element/s (e.g. illustrations, diagrams or photos) that you don't like?
_____ Yes _____ No _____ can't say

8. What can you suggest to make the manual more attractive?

_____

_____

IV. Effect to Users

Please put a Check on your answer.

Effect to the Mode of Learning of Students	YES	No
1. The manual can be easily understood even without assistance.		
2. The manual can be used for reference because it is complete.		
3. Can be used for review because the sentences were shortened and simplified.		
4. It motivates the students.		
5. Got high score during quiz because of the manual.		
6. Can understand the lesson well because of the manual.		
7. I can easily relate with the lesson because of the manual.		
8. I easily memorize the lesson whenever I study due to the manual.		
9. I don't worry whenever I didn't jot down notes because I can rely on my manual.		
10. The manual met my information needs with regard to the subject.		

What can you suggest to improve the effectiveness of the manual?

_____

What can you suggest for the improvement of the manual as a whole?

_____

For the Key Informants for the:

ACCURACY OF THE ENTOMOLOGY MANUAL

Name: _____ Field of specialization_____

Position in work _____

1. Are there any mistakes in the definition given in the manual?
_____Yes _____None
If yes, please give the defined word._____

2. Are there misspelled words in the manual?
_____Yes _____None
If yes, please give the misspelled word._____

3. Is there any inappropriate word you found in the manual?
_____Yes _____None
If yes, please give the word._____

4. Are the topics appropriate?

_____Yes _____No
If no, please give the inappropriate word._____

5. Are there inappropriate topics?

_____Yes _____None

If yes, please give word._____

6. Are the activities appropriate to the topic given?
_____Yes _____No
If no, please give the activity and the topic._____

7. Does the information presented agree with what you know?
_____Yes _____No

8. Does the information agree with other sources, especially print sources?
_____Yes _____No

9. Does the author provide sources or cite references?
_____Yes _____No

10. Is the information cited correctly?

_____Yes _____No

11. Does the author suggest other resources?

_____Yes _____No

12. Does the manual have the publishing year?
_____Yes _____No

Given the rating scale below, please rate the content of the manual in terms of its appropriateness and correctness of topics.

1) inappropriate A. Wrong
2) Neither appropriate nor inappropriate B. Neither correct nor wrong
3) appropriate C. Correct

Topics	appropriateness			correctness		
	3	2	1	A	B	C
1. Insect Metamorphosis						
2. Structure of Insect and Their Function						
3. Classification of Insect						
4. Insect Ecosystem						
5. Major Insect Pest of High Value Crops in the Philippines						
6. Insect Beneficial to Man						
7. Insecticide Screening						