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Development and Evaluation of Learning Modules in Rabbit Production

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ABSTRACT A newly-offered subject in agriculture, rabbit production, necessitated the development of instructional materials. This mixed-method study was conceptualized to develop and evaluate learning modules for the subject, utilizing the ADDIE model of instructional design. Development of ten modules took almost two years, and the first semester of usage was done with flexible learning methods. Student and faculty users assessed the acceptability in terms of objectives, content, organization and usability, and language, while pre-test and post-test scores determined the effectiveness of the modules. Based on the results, the students rated the modules with moderate acceptability, while instructors and professors rated them with high acceptability. The modules were effective in increasing the knowledge of students in both the midterm and final periods. The learning modules may help provide locally-suited learning materials in rabbit production for Philippine tertiary schools, and in disseminating information and awareness on rabbit as a high-potential livestock in the Philippines.

INTRODUCTION

Rabbit Production is a new major subject offering in Bachelor of Science in Agriculture, major in Animal Science in a tertiary institution in Bulacan province, Central Luzon, Philippines. The offering of this course stemmed from the inclusion of rabbit as a commodity thrust for research and extension of the state college. A partner-organization of the institution in the promotion of rabbit industry in the Philippines, has suggested the inclusion of rabbit production as a subject in agriculture programs. This was accepted by the institution so the course was included in the new curriculum, and was offered for the first time in August to December 2020 (1st Semester, SY 2020-2021).

Up to now, there are still no standards and guidelines for the Rabbit Production course from the Commission on Higher Education of the Philippines (CHED), since this is most probably the first time for it to be offered in an agricultural program, with sole focus on production aspects of meat-type rabbits. Rabbit has been studied only in veterinary medicine programs in the country, under the subject Laboratory Animal Management and Medicine (CMO 1 s.2018). For decades, rabbit has been considered only as a pet and laboratory animal in the Philippines, and only in recent years is it being introduced as a livestock or meat-producing animal.

Instructional materials are important tools in making the teaching-learning process effective (Abayan et al. 2021). The faculty of Philippine higher education institutions (HEIs) are encouraged to make their own instructional materials, since not all courses have available textbooks, while those from foreign authors are devoid of Philippine setting (Portana et al. 2021). Locally-suited instructional materials in higher education facilitate meaningful learning (Nicolas 2020). In order to improve teacher-made instructional materials, evaluation or validation is conducted as a research study in Philippine HEIs, focusing on acceptability, effectiveness, and/or quality (Terano 2015, 2018; Ramirez 2016; Nicolas 2020; Portana et al. 2021). Similarly, new textbooks are also evaluated to determine their value and suitability in classrooms worldwide (Fatima et al. 2015; Abhar 2017; Khodabandeh and Mombini 2019). Since the course Rabbit Production is new, the developed modules will be useful to the instructors or professors who will handle the course in its first semesters of offering. As pointed by Mohammadi and Abdi (2014), textbooks provide novice teachers with guidance, structure, consistency, and logical progression in a class.

Objectives

This study was conducted to develop and assess the acceptability and effectiveness of

Modules on Rabbit Production to its student and faculty users. Specifically, the study aimed to develop learning modules in the course Rabbit Production; determine the acceptability of the modules for its student and faculty users in terms of objectives, contents, usability, and language; and determine the effectiveness of the modules in improving student academic performance.

METHODOLOGY

This study used mixed methods to attain its objectives. The initial phases utilized qualitative approaches, while evaluation phase generated and analyzed quantitative data.

Development Phase

This study utilized the Analysis, Design, Development, Implementation and Evaluation or ADDIE model. According to Branch (2009), as cited by Nichols-Hess and Greer (2016), the ADDIE model includes: 1) analyzing the learning situation, 2) designing objectives and principles for the situation, 3) developing resources to meet the specifications, 4) implementing the learning resources, and 5) evaluating how the needs were addressed by the learning resources. The ADDIE model is one of the most common modes in instructional design, which can be used in any environment as online or face-to-face (Aldoobie 2015).

As a descriptive development research, the first phase of this study consisted of the ADDI part or analysis, design, development, and implementation which lasted for almost two years from 2018 to 2020. The analysis part focused on the needs analysis of the institution, target audience analysis in consultation with students and faculty, and topic analysis. The design part consisted of writing the learning objectives and sequencing of topics, based on the inputs from students and faculty. The development part was on content development, including the actual preliminaries, lecture content, and assessment part of each module. The implementation part was on the actual usage of the modules for the first batch of students who had the Rabbit Production course, which happened on the First Semester, School Year 2020-2021.

Evaluation Phase

As a descriptive evaluation research, the second phase focused on evaluation of acceptability by 140 students and 20 instructors/professors, and evaluation of effectiveness through pretest and posttest results. Evaluation forms for the modules were used to assess acceptability of: 1) objectives, 2) content, organization and usability, 3) language. A Likert Scaling Technique was used in the study assessing the acceptability, identifying 5 as the highest (highly acceptable) and 1 as the lowest (very unacceptable). The questionnaire was adapted from Nicolas (2020). Statistical mean was used to determine the acceptability, and results were interpreted using the following scale: 4.5-5.0 – highly acceptable, 3.5-4.49 – moderately acceptable, 2.5-3.49 – fairly acceptable, 1.5-2.49 – somewhat unacceptable, and 1.0-1.49 – very unacceptable. For the effectiveness, results of pretest and posttest were analyzed using paired t-test.

RESULTS AND DISCUSSION

Analysis, Design, Development, and Implementation

For the analysis part, it was found in the second half of 2018 that there was a real need for the learning modules since rabbit production will become a newly-offered course under the new curriculum for BS Agriculture, Major in Animal Science. This is the curriculum for Kto12 graduates, whose first batch entered college in School Year (SY) 2018-2019. Analysis of target users based on consultation with faculty and practitioners resulted in the need to focus the modules on basic information on rabbit production, from the history and background of the industry, and the advantages and disadvantages of rabbit raising in Philippine context, basic information in different body systems, management aspects on feeding, breeding, and health, up to record keeping and processing of rabbit meat and other products.

For the design part, initial list of topics was made, with the accompanying objectives. Students and faculty who have background knowledge, or are engaged in rabbit production, gave inputs for the topics to be included in the modules. The initial list was revised based on their inputs. The initial planned delivery form for the modules is by print, to be discussed in a face-to-

face mode. However, since it was not possible due to the pandemic, the modules were converted into a Portable Document Format (PDF) just prior to implementation, so that it can be easily shared online.

For the development part, continuous writing and revising was done for a period of eighteen months, incorporating the results from analysis and design phases, as well as some materials from relevant books and scientific references, and ideas from local webinars on rabbit production and social media posts of rabbit farmers. This phase resulted in 10 learning modules, as presented in Table 1, with the accompanying learning objectives.

For the implementation, instruction for the First Semester, SY 2020-2021 was done purely online, as was mandated by the Commission on Higher Education (CHED) to all higher education institutions in the Philippines in its Memorandum Order 04 s. 2020, or the Guidelines on the Implementation of Flexible Learning (CHED 2020). Survey of students showed that majority had slow internet connection with advanced level of digital literacy, and preferred a mix of online and offline activities. Hence, teaching and learning processes using the Rabbit Production modules for the first batch of student users (First Semester, SY 2020-2021) were conducted with the use of: 1) Messenger – a social messaging application, 2) Google classroom – a Learning Management System (LMS), and 3) Google Meet – a virtual conferencing application. Discussions on the topics were made via Google meet, al-

Table 1: Topic and objectives of the developed learning modules in rabbit production

Module No.	*Topic*	*Learning objectives*
1	Introduction to Rabbit Production	1. Define basic terminologies related to rabbit production; 2. Discuss the different types of rabbit farming systems; and 3. Explain how rabbit production is advantageous or disadvanta geous to production of other livestock and poultry species.
2	Anatomy and Physiology of Rabbits	1. Identify the different body systems; 2. Describe the different organs, their parts, and functions; and 3. Distinguish normal and abnormal appearance of organs.
3	Breeds and Types of Rabbits	1. Compare and contrast the different body types and classes of rabbits; 2. Describe the different breeds of rabbits; and 3. Explain the purposes of the common rabbit breeds.
4	Selection and Breeding Management	1. Elucidate the importance of selection and culling; 2. Define the commercially important traits of meat-type rabbits; 3. Differentiate the breeding programs; 4. Discuss the principles of breeding management; and 5. Perform various breeding management techniques and practices.
5	Care of Pregnant or Lactating Does and Young Rabbits	1. Discuss and perform methods of testing for pregnancy; 2. Describe the kindling process; and 3. Explain and execute ways of caring for the pregnant or lactat ing doe and young rabbits.
6	Feeding and Nutrition	1. Describe the current feeding practices in the Philippines; 2. Discuss the feeding needs of young rabbits from birth up to weaning; and 3. Identify the different rations and feed materials that are appro-priate for adult rabbits.
7	Housing Management	1. Define the important factors for housing management; 2. Differentiate the types of housing and housing materials; and 3. Describe the types of feeders.
8	Health Management	1. Identify the etiology of different rabbit diseases; 2. Describe the clinical picture of diseases in affected animals; and 3 Explain the preventive and control measures of rabbit diseases.
9	Record Keeping and Financial Management	1. Explain the reasons for record keeping; 2. Create and maintain records for different types of stocks and activities; and 3. Analyze the financial status of the farm.
10	Dressing and Meat Processing	1. Discuss important precautions in rabbit slaughtering; 2. Perform the different steps in dressing rabbits; and 3. Create a meal or processed product from rabbit meat.

though few students are able to engage in live online class discussions due to internet connectivity. The modules in PDF form were shared via messenger in two batches: one for the midterm period, and one for the final period. The students can read the saved copies of the modules anytime using their own laptop or mobile phone. The soft copy also saves on printing cost. In the beginning of the midterm and final periods, the students were given pre-tests to determine their initial knowledge on the subject. Term examinations were given in the end to determine their accumulated knowledge from the modules and discussions, and the increase in knowledge compared to the pre-test results. The pre-test and post-test were a combination of objective and essay types of questions, submitted by the students via Messenger and Google classroom.

Evaluation of Acceptability

In Table 2, the evaluation results on the acceptability of the Learning Modules in Rabbit Production are presented.

In terms of objectives, the student respondents gave 3.85 mean rating for the objectives being 'specific and clearly stated,' 3.86 for being 'attainable and measurable,' 3.93 for being 'suitable to the topic', and 3.94 for being able to 'promote critical thinking and creativity.' With a composite mean of 3.90, the objectives of the learning modules were rated as moderately acceptable. These results imply that the students were contented with the learning objectives in the module.

On the other hand, faculty respondents gave 4.94 mean rating for the objectives being 'specific and clearly stated,' 4.89 for being 'attainable and measurable,' 5.0 for being 'suitable to the topic', and 4.84 for being able to 'promote critical thinking and creativity.' With a composite mean of 4.91, the objectives of the learning modules were rated as moderately acceptable. These results imply that the faculty users were highly contented with the learning objectives in the module.

Bloom's taxonomy guided the authors in the writing of objectives. Girija (2019) emphasized that objectives are the 'crux' and 'key' of the entire process of teaching and learning. Bloom's taxonomy is a helpful tool in making objectives, so that there will be objectives from the different learning domains, with varying level of difficulty or complexity (Adams 2015).

Table 2 also shows the acceptability for students the content, organization and usability of the learning modules, with a composite mean of 3.84 or moderately acceptable. The highest mean obtained was 3.88 in the indicator "There is clear presentation of the discussions" while the lowest mean is at 3.80 for two indicators on pertaining to the "suitability to the learning ability of the students" and "usefulness to the teacher and students to provide adequate information." These results mean that the student respondents were satisfied with the contents, organization and usability of the modules.

For faculty respondents, the acceptability of the content, organization and usability of the learning modules was higher, with a composite mean of 4.88 meaning they found the modules highly acceptable. The highest mean obtained was 4.94 in four indicators: "the topics are organized effectively," "the content is current, relevant and accurate," "the contents are suitable to the learning ability of the students," and "the modules are useful to the teacher and students to provide adequate information." These results mean that the faculty respondents were highly satisfied with the contents, organization and usability of the modules.

The contents of the modules are based on the set learning objectives, and on the syllabus approved by the institution for the Bachelor of Science in Agriculture curriculum. In his study, Terano (2015) claimed that the high acceptability of the contents, structure and format of his developed instructional material for student respondents imply that it was responsive to the needs and was appropriate to the level of understanding of the students.

As shown by the mean rating of 3.80, the language used in the manual is also moderately acceptable for the students. The highest mean of 3.83 was obtained in the indicator "no sexist or racist language and do not portray any negative stereotype," while the lowest mean of 3.73 was for the indicator "no grammatical or spelling error," although all indicators still fall under the moderately acceptable range. These results imply that the students found the language of the modules satisfactory.

Table 2: Evaluation results of the acceptability of the learning modules to student and faculty users

Indicators of acceptability	*Students*		*Faculty*	
	Mean rating	*Verbal description*	*Mean rating*	*Verbal description*
Objectives	**3.90**	**Moderately acceptable**	**4.91**	**Highly acceptable**
1. The objectives are specific and clearly stated.	3.85	Moderately acceptable	4.94	Highly acceptable
2. The objectives are attainable and measurable.	3.85	Moderately acceptable	4.89	Highly acceptable
3. The objectives are suitable to the topic.	3.93	Moderately acceptable	5.00	Highly acceptable
4. The objectives promote critical thinking and creativity.	3.94 3.94	Moderately Moderately acceptable	4.83	Highly acceptable
Content, Organization and Usability	**3.84**	**Moderately acceptable**	**4.88**	**Highly acceptable**
1. The topics are organized effectively.	3.86	Moderately acceptable	4.94	Highly acceptable
2. The length of the discussion is appropriate.	3.81	Moderately acceptable	4.72	Highly acceptable
3. The content is current, relevant and accurate.	3.86	Moderately acceptable	4.94	Highly acceptable
4. The contents are organized effectively into learning units, from simpler to complex.	3.86	Moderately acceptable	4.83	Highly acceptable
5. There is clear presentation of the discussions.	3.88	Moderately acceptable	4.83	Highly acceptable
6. The contents are suitable to the learning ability of the students.	3.8	Moderately Moderately acceptable	4.94	Highly Highly acceptable
7. The modules are useful to the teacher and student for it provides adequate information on the course/subject.	3.8	Moderately acceptable	4.91	Highly acceptable
Language	**3.80**	**Moderately acceptable**	**4.94**	**Highly acceptable**
1. There is no grammatical or spelling error within the texts of the modules.	3.73	Moderately acceptable	4.83	Highly acceptable
2. The language used is at the right level for the students.	3.81	Moderately acceptable	4.94	Highly acceptable
3. There is no exaggeration, obvious bias, dogmatic or arbitrary statements.	3.82	Moderately acceptable	5.0	Highly acceptable
4. There is no sexist or racist language, and do not portray any negative stereotypes.	3.83	Moderately acceptable	5.0	Highly acceptable
Grand Mean	**3.85**	**Moderately acceptable**	**4.91**	**Highly acceptable**

For faculty respondents, as shown by the mean rating of 4.94, the language used in the manual is also highly acceptable for them. The highest mean of 5.0 was obtained in the indicators "there is no exaggeration, obvious bias, dogmatic or arbitrary statements," and "there is no sexist language, and do not portray any negative stereotypes," while the lowest mean of 4.83 was for the indicator "no grammatical or spelling error," although all indicators still fall under the highly acceptable range. These results imply that the teachers found the language of the modules highly satisfactory. Appropriate use of language is a must for textbook writers (Gachukia and Chung 2005), and faulty language harms the credibility of a textbook (Luey 2010).

For students, the grand mean obtained for the learning modules, was 3.85, implying that the student evaluators find the objectives, contents, organization, usability, and language moderately acceptable. For teachers, the grand mean was 4.91, meaning they found the modules high-

ly acceptable in all the indicators. The results are good and encouraging, but there is still room for improvement to inhance acceptability for student users, so the authors have decided to further improve the learning modules before its usage for the second batch of student users for SY 2021-2022. As Nichols-Hess and Greer (2016) emphasized, the ADDIE model is iterative, involving review and revision throughout the design process, allowing the instructional designers to incorporate feedback throughout.

Evaluation of Effectiveness

Pre-test and post-test were administered both during the midterm and final period. Results of the paired t-test, to determine the effectiveness of the lecture manual using the pre-test and post-test scores, are shown in Table 3.

For the midterms, the results from the pre-test show a mean of 58.09, and a standard deviation of 11.49, indicating a low level of achievement. The results increased for the post-test, with a mean of 85.31, and a standard deviation of 12.68. The derived mean difference is 27 points, with a t-value of 24.82. The computed p value of 0.000 which is less than 0.01 significance level show that there is highly significant difference between the tests.

Likewise, the results from the pre-test in final term, which had a mean of 66.11, and standard deviation on 12.83, increased by 25.37 points to achieve a post-test mean of 91.48, at a standard deviation of 7.66. There is a strong evidence ($t = 25.05$, $p = 0.000$) of increasing scores using the modules at 0.01 level of significance.

It can be inferred from all these results that the learning modules have positively affected the performance of the students. This may be due to the fact that there are no widely available references on rabbit meat production, especially for the students who do not have good internet connectivity. The only source for students in order to answer the questions were the electronic copies of the modules that were sent to them through the learning management system and social messaging application. The correct answers for the pre-tests were observed to be for questions that tackle general animal production principles, thus the students have applied prior knowledge on other animal production subjects in order to answer them correctly. The questions that were answered incorrectly during the pre-test but already answered correctly during the post-test were questions that are very specific for meat-type rabbit production.

Khalil and Elkhider (2016) explained that the lack of foundational knowledge can cause disengagement in learning. Since the students in this particular study have shown foundational knowledge on animal production, they easily grasped the concepts given in the course of rabbit production, as shown by increased knowledge in the post-test. In the research review by Sun and Chen (2016), one of the bases of effective online teaching is a well-designed course content. The test results on this study may be a reflection of well-designed course content for the rabbit production modules.

Based on the results of acceptability and effectiveness of the modules for the first batch of student users, the modules are being revised and improved further, in order to give an enhanced learning experience for the next batches of students. The authors will likewise subject the modules to these new batch of students, to determine improvement in acceptability and effectiveness.

CONCLUSION

A set of instructional materials made of ten learning modules in the course rabbit production, was developed and evaluated following the

Table 3: t-test analysis on the difference between the effectiveness of the lecture manual in midterm and finals examination

Term	*Test*	*Mean*	*SD*	*Mean Difference*	*t-value*	*p-value*
Midterm	Pretest	58.0857	11.4901	27.2286	24.820**	0.000
	Posttest	85.3143	12.6804			
Finals	Pretest	66.1143	12.8338	25.3714	25.051**	0.000
	Posttest	91.4857	7.6596			

Legend: ** significant difference $p \leq 0.01$

ADDIE instructional design model. Analysis, design and development of the modules were based on the needs of the institution and learners, and the current practice of rabbit raisers in the locality. Evaluation of acceptability showed that student users rated the modules with moderate acceptability, while faculty users rated them with high acceptability, in terms of objectives, content, organization and usability, and language. The learning modules were found effective in increasing the knowledge of students as shown by the pretest and posttest results for the midterm and final period.

RECOMMENDATIONS

The learning modules may be subjected to continuous evaluation by the next batches of student and faculty users. As more researches on rabbit production in the country are conducted, the contents of the modules may be enhanced using more updated research-based production practices. Similar studies on the development, acceptability and effectiveness of instructional materials may be conducted by tertiary education faculty toward the attainment of quality and relevant education for the future generatios.

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