WEST VISAYAS STATE UNIVERSITY
COLLEGE OF EDUCATION
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Iloilo City

NatPro LabPro: DEVELOPMENT AND EVALUATION OF INNOVATIVE LABORATORY PACKAGE IN SCIENCE (ILPS)

A Dissertation Presented to

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In Partial Fulfilment

of the Requirements for the degree

Doctor of Philosophy in Science Education

(Biology)

by

Ricky Baquilar Acanto

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APPROVAL SHEET

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Ricky B. Acanto

Approved by the Research Committee:

PETER ERNIE D. PARIS, PhD, Chair

CHIVE G. GABASA PhD, Member

STEPHEN G. SABINAY, PhD, Member

VILMA F. TEMPLORA, PhD, Member

RONILO V. APONTE, PhD, Outside Expert

IGNACIO S. TIBAJARES JR., PhD, Adviser

RICKY M. MAGNO, LPT, PhD
Dean

WEST VISAYAS STATE UNIVERSITY
COLLEGE OF EDUCATION
GRADUATE SCHOOL
Iloilo City

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Abstract

Innovation is translating scientific and technological knowledge into new products or processes. It is vital for teachers to continually search for new ways to keep students engaged and motivated. An innovative teacher always discovers and develops new methods and materials to ensure students have the best learning experiences. This study focused on developing and evaluating the Innovative Laboratory Package in Science (ILPS) intended for science investigatory/capstone projects in a natural product screening. It employed the development research design to delve into the assessment of the least and most common laboratory analyses/tests and challenges encountered by students and teachers in conducting science investigatory projects/capstone projects in natural products, the description of the developed ILPS, the experts' validation of the developed ILPS, the teachers' evaluation of ILPS, and the teachers' experiences in using the ILPS. Participants were chosen through purposive sampling. The developed innovative laboratory procedures followed the Analyze participants' characteristics and needs; State the objectives; Select, modify, or design materials; Utilize materials; Require participant's response; Evaluation of materials (ASSURE) model of instructional systems design. The results of the study revealed the following: The least common laboratory analyses/tests used by students and teachers in conducting science investigatory/capstone projects in natural products were basic pharmacological-

toxicological assay (analgesic property, anti-inflammatory property, antipyretic property), an antioxidant assay of plant extract and a cytotoxic assay of plant extract (ALD, LD_{50}, LC_{50}, BSLA), while the most common ones were the insecticidal property of plant extract, microbiological screening of plant extract (antimicrobial activity, MIC, MBC), and molluscicidal property of plant extract; the availability of laboratory materials (equipment, reagents) and financial support (expensive laboratory analysis) was found by the participants to be moderately challenging, respectively. The developed ILPS were the following: Identification, Preparation, and Extraction of Plant Sample; Phytochemical Screening of Plant Extract, Antioxidant Screening using Paper-based DPPH (2,2-diphenyl-1-picrylhydrazyl) Assay and Image J Software Data Processing; Cytotoxic Test using The Brine Shrimp Lethality Assay (BSLA); UV Protective Activity of Plant Extract; Antiangiogenic/Angiogenic Assay of Plant Extract using Chorioallantoic Membrane Method (CAM); and Antimitotic/Mitotic Assay (*Allium cepa* Root Tip Method). The kits developed include the DPPH paper-based device for antioxidant quantification; paper-based chlorophyll device for quantification of chlorophyll content; improvised water bath for plant extraction; hatching kit for *nauplii*; improvised UV box for UV protective activity and chlorophyll content of the plant extract; and laboratory devices which contain materials vials, test tubes, droppers, capillary tube, evaporating dish, Pasteur pipette, funnel, masking tape, plunger, aspirator, filter paper, and magnifying glass intended for extraction, phytochemical screening, antioxidant assay, and cytotoxic activity using the brine shrimp lethality assay. The content, structure, coherence, learning activities, usefulness, general appearance and organization, and innovativeness of the ILPS were

regarded by the experts and teachers as outstanding; as for the teachers' experience in using the ILPS, the following theme was gleaned from their responses: (a) new, meaningful, and engaging experience; (b) learning opportunities that promote critical thinking and scientific attitude; (c) easy and flexible experiments; (d) empirical tasks that equip students with new scientific skills; (e) cost-effective instructional innovation; the ILPS was developed on the basis of the least common laboratory tests/analysis conducted. Textbook writers and instructional material developers may draw insights from the study to design textbooks and other learning materials that promote innovation. This study primarily recommends that stakeholders in education carry out innovations in both curricula and programs intended for science investigatory/capstone projects of paramount importance.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

References

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