ASSESSMENT OF INTEGRATED SCREENING SYSTEM STRUCTURE AS INSTRUCTIONAL MATERIAL FOR ELECTRONICS AND ELECTRICAL COURSES

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ABSTRACT. *This study aimed to assess the Integrated Screening System (ISS) Structure as Instructional Material for Electronics and Electrical Courses, developed at the University of Science and Technology of Southern Philippines (USTP), Cagayan de Oro City, and Caraga State University Cabadbaran City (CSUCC), Philippines. This study utilized the descriptive research method to analyze the data gathered. The study used a researcher-made instrument that underwent instrument validation using the scale-level content validity index. The participants of this study were eleven (11) Electronics and Electrical Technology experts. Based on the study findings, the advanced Integrated Screening System Structure as an instructional material is relevant. Utilizing the advanced Integrated Screening System Structure as an instructional material can promote a better learning experience in Electronics and Electrical Technology courses, particularly in teaching the concepts of sensors, embedded systems, and programming. A study on the student's performance using the advanced Integrated Screening System Structure should be conducted to determine its effectiveness in experiential learning.*

Keywords: assessment, electronics, evaluation, instructional material, integrated screening system,

1. INTRODUCTION

Electronics offer an affluent, flexible, and friendly learning environment for teaching technology, fostering students' broad competencies such as design, problem-solving, creative thinking, and teamwork [1]. Unfortunately, they need a more application-oriented focus [2]. The researcher observed that students in Electronics Technology-related courses need help comprehending its fundamental concepts. Likewise, students need help understanding how this basic knowledge converts into actual applications. These problems lead to students needing more confidence to express their ideas and lessening their motivation to learn. There is a need for instructional material incorporating fundamental theories and concepts into an actual hands-on experience. It will help facilitate learning and increase their motivation for Electronics and Electrical Technology-related courses. The development of the advanced Integrated Screening System Structure is timely to provide hands-on experiences to students during face-to-face laboratory classes. This study aims to assess the advanced Integrated Screening System Structure [3,4] and its potential as instructional material in electronics and electrical-related courses. Using instructional materials helps learners comprehend ideas and ensure long-term knowledge retention [5].

The objective of the study. Generally, the study aimed to assess the advanced Integrated Screening System structure's relevance to instruction in electronics and electrical courses.

Relevance to Instruction. It refers to the capacity of the Integrated Screening System structure to be used as instructional material. It is measured in terms of the following conditions: it allows instructors to act as a facilitator ultimately, provides opportunities for instructors to motivate students to learn, enables the students to have control over their pace of learning, and highly encourages students to discover new knowledge by relating to the learner's pre-existing knowledge and provide opportunities for students to evaluate further information and modify existing knowledge, and provide opportunities for students to consider new information and change existing knowledge. Moreover, it also refers to providing opportunities for students to work together in small groups. It also allows students to maximize their skills and each other's learning during the entire learning process and provides students accountability for some aspects of the group activity. It also provides opportunities for students to demonstrate what they have learned, provides opportunities for students to apply core concepts to new contexts, and can be utilized as a demonstration means for the enhancement of students' manipulative skills.

2. REVIEW OF RELATED LITERATURE

Contemporary Issues in Teaching Electronics. The rapid development of electronics in recent decades is changing our lives in a globalized world. Our everyday life, industry, communications, transport, and medicine depend more on electronic devices than we realize [6], especially in the present generation. Electronics as a discipline is often unseen "above the scene." For example, robotics is one of the multidisciplinary engineering fields used in integrating science and mathematics with technology at the level of pre-higher education as well as within higher education. Robotics is often a part of mechatronics courses, where topics about the mechanism, control electronics, communication architecture, and programming environment integrate. Although electronics are supposed to be one of the three founding disciplines besides mechanical engineering and computing, it is often used only on a level of "plug-and-play" components. On the other hand, various disadvantages arise from using electronic devices to deliver instruction. These drawbacks include increased technology dependency, material incompatibility, costliness, inconsistency of content, and reduced teacher-student interactions [7].

Recently, there have been reports that students' academic achievement has been below expectations. This failure is attributable to teachers' continuous use of unsuitable instructional methodologies (mostly a traditional didactic approach) [8,9]. Therefore, teachers of courses like Basic Electronics faced challenges presenting relevant classroom activities that can facilitate conceptual change, allow understanding, and recognize individual differences among students [10]. In addition, inadequate instructional materials and facilities cap undue students' low academic performance in continuous assessment scores, low semester examination scores, grossly poor graduating CGPA, and deficient practical skill acquisition [11].

Constructivist-based Instructional Material. The goal of instruction is to make the learner see the world through their own eyes, not through anyone else's eyes, much less the teachers'. Constructivist-based instructional approaches have these qualities. Teachers should adopt a learner-centered teaching strategy to help learners see things based on their conceptualization. It is the central focus of the constructivist theory of learning. In the constructivist learning approach, students learn better by developing and constructing their understanding of the material based on their knowledge, beliefs, and experiences, in concert with new knowledge presented in the classroom. The theory is a branch of cognitivism since both conceive learning as a mental activity. But the constructivist approach to learning differentiates itself from traditional cognitive theories in several ways. For instance, most cognitive psychologists consider the mind a reference to real-life scenarios, which enable unique reality [12]. It suggests that learners do not transfer knowledge from the real world into their memories but by building personal interpretations of the world based on their experiences and interactions. It makes their interpretation of knowledge open to constant modification where they can learn and unlearn things. Hence, new meaning surfaces within the contexts in which knowledge is relevant. The learner and environmental factors are crucial to constructivists because the interaction creates knowledge. Every action is an application of higher-order thinking skills that strengthen prior knowledge. Constructivism enables learners to use previously gained experiences and deepen them through actual situations in the presence of peer-to-peer interaction and realia [10,13].

Uses of Instructional Materials. Instructional materials and facilities are necessary for practical teaching-learning experiences in electrical and electronics technology education. Instructional materials and facilities help facilitate teaching-learning and influence substantial and continuous changes in technical behavior [11]. Instructional materials are all information carriers used to record, store, preserve, transmit, concretize, or retrieve information for teaching and learning. Furthermore, it would make discovered facts glued firmly to students' memory [11,14]. Instructional materials include audio-visual aids, tools, equipment, machines, educational materials such as chats, and ICT instructional resources. He also said that instructional aids mean all the materials or teaching aids or material resources the teacher utilizes to make teaching and learning more effective and meaningful to students. In the same sense, vocational and technical education facilities encompass all essential hand tools, equipment, classrooms, workshops, laboratories, and electrical and electronic instruments, which help the learners to learn appropriately. It means that technology and vocational education programs require tools and equipment that will help facilitate and acquire occupational skills in the diverse areas of electrical and electronics technology [13,15,16]. It observed that valuable skills could be developed and reinforced by appropriately selecting and using instructional facilities, materials, and tools.

3. METHODOLOGY

Research Design. The study utilized the descriptive research method. It is a method used to describe existing phenomena as accurately as possible [17], wherein the participants assessed the advanced Integrated Screening System Structure as instructional material concerning its relevance to instruction in Electronics and Electrical Technology courses.

Participants of the Study and Sampling Procedure. The researcher applied the purposive sampling method. Purposive sampling is used to determine the participants using a given set of criteria due to limited resources [18,19]. It involves identifying and selecting individuals or groups incredibly knowledgeable about or experienced with a phenomenon of interest [20]. The study participants were eleven (11) electrical, electronics, and information technology experts. They were carefully selected by the researcher based on their length of service in teaching and expertise in the area of Electronics and Electronics related subjects.

Research Instrument and Instrument Validation. The study used two (2) instruments: the researcher-made Assessment Tool for the Entrance Screening Structure as Instructional Material [21]. The assessment tool was a researcher-made instrument used to determine the relevance of the advanced Integrated Screening System Structure as an Instructional Material in teaching Electronics and Electrical Technology courses, particularly in the concepts of sensors and embedded systems and programming. This instrument follows a four-point Likert Scale. It contains twelve (12) statements describing the developed ISS's potential to promote independent learning, collaboration, and experiential learning.

Six (6) experts in Electronics and Electrical Technology validated the assessment tool for the advanced Integrated Screening System Structure as Instructional Material. Below are the results of the expert's judgment on the degree of relevance of the item statements, as illustrated in Table 1 on the scale-level content validity index (S-CVI).

Further, table 1 shows the validity index result. It was evident that the experts agreed on the relevance of the twelve (12) item statements in the assessment tool for the developed integrated screening system structure as instructional material. The researcher-made instrument went through a validity index using ratings of items by experts. When a new scale is formed, researchers following rigorous scale development procedures are expected to provide extensive information about the scale's reliability and validity [22].

Table 1. Scale-level content validity index (S-CVI) by six experts.

Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	No. of Agreement	CVI
1	X	X	X	X	X	X	6	1.00
2	X	X	X	X	X	X	6	1.00
3	X	X	X	X	X	X	6	1.00
4	X	X	X	X	X	X	6	1.00
5	X	X	X	X	X	X	6	1.00
6	X	X	X	X	X	X	6	1.00
7	X	X	X	X	X	X	6	1.00
8	X	X	X	X	X	X	6	1.00
9	X	X	X	X	X	X	6	1.00
10	X	X	X	X	X	X	6	1.00
11	X	X	X	X	X	X	6	1.00
12	X	X	X	X	X	X	6	1.00

4. RESULTS AND DISCUSSION

Assessment of Experts on the Integrated Screening System Structure as an instructional material regarding its relevance to Electronics and Electrical courses instruction. Table 2 illustrates the results from the assessment of Electronics instructors on the Integrated Screening System Structure as to its relevance to instruction in Electronics and Electrical Technology Courses. The experts evaluated the designed Integrated Screening System (ISS) Structure as instructional as Highly Acceptable. It implied that the ISS structure could provide opportunities for students to consider new information and modify existing knowledge and provide opportunities for students to demonstrate what they have learned. Likewise, it can also offer opportunities for students to apply core concepts to new contexts and display students' manipulative skills with mean ratings of 3.73, 3.82, 32 3.73, 3.73, and standard deviations of 0.467,0.405, 0.467, and 0.467, respectively. It further indicated that teachers could utilize the ESS as instructional material to make teaching and learning more effective and meaningful to students [11].

Furthermore, the experts regarded the ISS structure as an instructional material as Moderately Acceptable. It implied that it could allow the instructors to act entirely as facilitators and provide opportunities for instructors to motivate students to learn and control their learning pace. Moreover, the ISS structure as an instructional material could encourage students to discover new knowledge by relating to the learner's pre-existing knowledge, connecting major concepts to their personal experiences, and working together in small groups. The ISS structure could maximize their learning during the entire learning process and show accountability for some aspects of the group activity. It is evident with mean ratings of 3.45, 3.64, 3.36, 3.55, 3.64, 3.55, 3.55, and 3.36, respectively. The results implied that the advanced Integrated Screening System Structure as an instructional material could assist students in designing and constructing their understanding of the material based on their knowledge, beliefs, and experiences in concert with new knowledge presented in the classroom [10,11]. The overall results showed that the Integrated Screening System Structure as an instructional material is Moderately Acceptable, with a grand mean of 3.59. The results showed the potential of the ISS as instructional material to help students build personal interpretations of the world based on their experiences and interactions [11] and help the students to learn correctly [15] in Electronics and Electrical Technology course subjects, particularly in the concepts of sensors, embedded system, and programming**.**

5. CONCLUSION AND RECOMMENDATION

Conclusion. The integrated screening system as an instructional material is relevant based on the study results. It can be utilized by learners in Electronics and Electrical courses, particularly in teaching the concepts of sensors, embedded systems, and programming.

Recommendation. Electronics and Electrical Technology instructors may use the integrated screening system as instructional material to teach sensors, embedded systems, and programming concepts. A study on students' performance using the Integrated Screening System structure is suggested to determine its effectiveness in experiential learning.

Table 2. Assessment of Experts on the developed Integrated Screening System (ISS) structure as instructional material as to its relevance to instruction in Electronics and Electrical Courses

Item Statements	SA (4)	A (3)	D (2)	SDA (1)	TWP	$\bar{x}$	Std. Deviation	VD
1. The developed ISS can be used as IM to allow the instructors to act as facilitators.	7	3	0	1	38	3.45	0.934	MA
2. The developed ISS can be used as an IM to provide opportunities for instructors to motivate students to learn.	7	4	0	0	40	3.64	0.505	MA
3. The developed ISS can be used as IM for the students to control their learning pace.	4	7	0	0	37	3.36	0.505	MA
4. The developed ISS can be used as IM, encouraging students to learn new knowledge by relating to the learner's pre-existing knowledge.	6	5	0	0	39	3.55	0.522	MA
5. The developed ISS can be used as IM to provide opportunities for students to evaluate new information and modify existing knowledge.	8	3	0	0	41	3.73	0.467	HA
6. The developed ISS can be used as an IM to provide opportunities for students to connect major concepts to their personal experiences.	7	4	0	0	40	3,64	0.505	MA
7. The developed ISS can be used as IM to allow students to work together in small groups.	6	5	0	0	39	3.55	0.522	MA
8. The developed ISS can be used as IM to allow students to maximize their skills and each other's learning during the entire learning process.	6	5	0	0	39	3.55	0.522	MA
9. The developed ISS can be used as IM, showing that students are accountable for some aspects of the group activity.	4	7	0	0	37	3.36	0.505	MA
10. The developed ISS can be used as IM to provide opportunities for students to demonstrate what they have learned.	9	2	0	0	42	3.82	0.405	HA
11. The developed ISS can provide opportunities for students to apply core concepts to new contexts.	8	3	0	0	41	3.73	0.467	HA
12. The developed ISS can be used as IM to demonstrate students' manipulative skills.	8	3	0	0	41	3.73	0.467	HA
Grand Mean			**3.59**				**MA**	

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