

“Development and Validation of Learning Modules in Automotive Technology”

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Abstract

The research study aimed to develop and validate learning modules in Automotive Technology.

During the process of development, the learning modules were given to a group of Automotive Technology teachers. The learning modules were generally rated “Strongly Agree” with the overall weighted mean. A pre-test/post-test experimental research design was used to determine the effect of the module in the students’ performance. There were two groups of respondents: the control group and the experimental group. The control group was used the lecture method and the experimental group was used the developed learning modules.

As a result of students’ performance on test conducted, the students who utilized modules were superior and more consistent over those who underwent traditional chalk-and-talk style.

Hence, the use of modular instruction should be motivated with a noble purpose, stirred by the needs of the students and one that encourages independent and lifelong learning among the prospective students.

Keywords:Development, Validation, Learning Module, Automotive Technology

Introduction

Education is the most effective agent for social change and national development. It is through education that a country is provided with productive manpower that carries out societal transformation and progress. Schools at all curriculum levels are tasked to provide learners with necessary knowledge, skills and attitudes that will prepare them as active contributors for national growth and development.

A major sub-system of education dealing with the technological aspects of the environment is technology education. It deals with the development of technical knowledge, skills and attitudes needed to enter into and/or progress in the world of work or prepare people for productive and meaningful citizenship. The goals and objectives of technology education focuses to improve the quality of technical education with the view of producing skilled and middle-level technical workforce for the manpower needs of the industrial sector; the

promotion industry-based training education in technical skills, the establishment of stronger and functional linkages with the business and industry sectors, development of entrepreneurial competencies of future industrialist / students that will lead and motivate them for self-employment, inculcation of work values and right attitudes for effectiveness and efficiency in the job and the promotion and strengthening of the quality of technical education and skills development program of the university to attain regional, national and international competitiveness.

In view of the above cited objectives and in consideration of the present educational system as well as the need for our country to become globally competitive, students are being trained to the utmost of their capabilities through the use of modern instructional materials and modules which plays a vital role in the attainment of the goals and objectives of technology education. The act of teaching is so complex that it cannot be said that a specific way of teaching is superior to other ways for all purposes, with all teachers, with all students for all times and circumstances. Certain procedures, teaching styles and techniques that are generally not recommended seem to work well for a specific teacher. There is no fast rule in the choice of the best strategy to be used in teaching. The teacher should adapt different strategies of teaching to suit the needs of the students (Abad, 2006).

The skill in selecting the right strategies in the context of a particular lesson is critical (Salandan, 2005). The teacher should be knowledgeable and observant enough on how the students learn to be able to apply the appropriate teaching techniques and strategies.

Gregorio (1976) claimed that successful classroom instruction depends upon the technique of teaching; through it, the learning activity of the learners is guided. Without the organization of effort and material to achieve a definite goal, would be a waste of time and effort and would not achieve satisfactory results in content learned or study habits. It is the teaching technique that provides this guidance for the learners.

For more than three years that the researcher has been teaching this trade area, he observed that with technology revolutionizing education, teachers at all levels need to assess their classroom practices since technology implies that learning activities are based on applied knowledge in most of the content of the subjects.

Based from the CMO no. 56, series of 2007, The success of instruction in the teaching-learning process is not only on a traditional method, but the use of instructional materials like learning modules can also helped the enhancement of instruction in the teaching learning process used as an alternative delivery method. A learning module is presented to the learners for the activities inside the classroom where the desired knowledge and skills of the learners are developed. The need for developing and validating learning modules is greatly uplift the interest of the learners. As such, classroom activities are given priority attention because it is the classroom where the action is, where all learners are involved in learning interaction.

Therefore, it is in the classroom where the lessons are being taught, where the instructional materials and methods are introduced by teachers and where the learners acquire learning

tasks and skills. The learners are evaluated through performance. Moreover, classrooms can be organized for a better environment so that the learners can experience and achieve better performance in the teaching-learning process. To make teaching effective the researcher ardently wanted to develop and validate the learning modules in automotive technology particularly in servicing engine mechanical system.

The purposes of a Learning Module: First, to individualize (or to permit use of teams of learners in) instruction; Second, to provide a conceptual model for learning that minimizes the need for conventional, verbalized, instructional techniques; Third, to enable (or require) teachers to analyze the learning process. Fourth, to improve instruction through improved evaluation resulting from the formulation and measurement of learning outcomes expressed in measurable terms; fifth, to maximize the effective use of instructional media and group exercises; and last to permit learning to occur outside the presence of the teacher.

The researcher is currently teaching subjects in Automotive Technology which includes lessons on servicing engine mechanical system. For the three years of teaching this course, he has encountered challenges in teaching the skills using the high-technology facilities found in the automotive laboratory such as the different engines with remote control and with color coding devices. Furthermore, one of the reasons of developing learning modules is that the researcher is also engaged in the Extension and Training Services Program in which the provision of trainings related to automotive technology are also being conducted to the different extension program beneficiaries.

It is for these reasons that the researcher have developed and validated instructional modules that can be complementary to the facilities available and may encourage the students to understand the concepts and develop their technical skills using these learning modules. The modules may used as alternative delivery mode in teaching lessons of the researcher. These modules in automotive technology composed of servicing the cooling system, lubricating system, and fuel system of an automobile. Automobile servicing will give the learners the opportunity to learn the basic knowledge and skills in automotive servicing. The unit of service engine mechanical system covers the knowledge, skills and attitudes required for an automotive servicing course. The learning modules are envisioned to be user friendly, suited to the level of the students and responsive to the current demands of the shop and the industrial sector.

Conceptual Framework

Quality education is measured by the quality of its products. Higher Education Institutions especially those offering Teacher Education Programs has to produce quality graduates for better quality of life, for the progress of the country, and to cope with global competitiveness. Isabela State University is one of the educational institutions in the region that accepted the challenges for quality education along teacher education.

This study is anchored on the theories on individualizing instruction through learning modules. According to Kemp and Smelie (1989), individualizing instruction plays a big role in modular instruction. Its main attributes include the individual assuming responsibility for

their own learning, proceeding with activities and materials at their own level and studying at their own pace. This principle is in consonance with Thorndike's law of readiness and law of effect where the law of readiness states that when a person is prepared to respond or act, giving the response is satisfying and being prevented of doing so is annoying.

The College of Industrial Technology and Education, one of the colleges of the Isabela State University, City of Ilagan Campus offers Bachelor of Technical Teacher Education major in Automotive Technology. Its curriculum is ladderized in which after completing the first two years of the curriculum, students enrolled will undergo screening process to continue the four year degree program. It was observed that few graduates of the BTTE ladderized program can qualify the screening process. These are the challenges on the part of the researcher to encourage the enrollees of the program to study more, in order to improve their performance. This led to the development and validation of learning modules which is deemed very important to supplement and address the needs of the students.

The study was conducted to develop and validate learning modules in Servicing Mechanical System. This research study used the Isman Instructional Design Model (Isman, 2011) in the development and validation of the learning modules, as adopted from the study of Ricardo (2016). The major goal of Isman Instructional Model is to point out how to plan, develop, implement, evaluate, and organize full activities effectively so that it will ensure competent performance of the students. (Isman, 2011). The theoretical foundation of the new model comes from behaviorism, cognitivism and constructivism views.

The first step in the Isman Model is input. The input step involves identify needs, identify contents, identify goal-objectives, identify teaching methods, identify evaluation materials and identify instructional media. Isman (2005) stated that the main goal of first step is to identify factors for input.

The second step in the Isman Model is process. The process step involves testing prototypes and redesigning of instruction and teaching activities.

The third step is the output. The output process involves testing and analyzing results. To determine student learning, educational management and evaluation process should be implemented in the classroom.

The fourth step is feedback. The feedback involves revising instruction based upon the data collected during implementation phase. If during the phase, teacher finds that students are not learning what the plan wanted them to learn, or they are not enjoying the learning process, teacher will try to revise and improve some aspect of their instruction to enable the students to accomplish their goals.

The final step is learning. The learning process involves full learning. In this process, teachers want to ensure that their students have learned what the instructional plan wanted them to learn. This is when the pretest/posttest was conducted to test the module effectiveness.

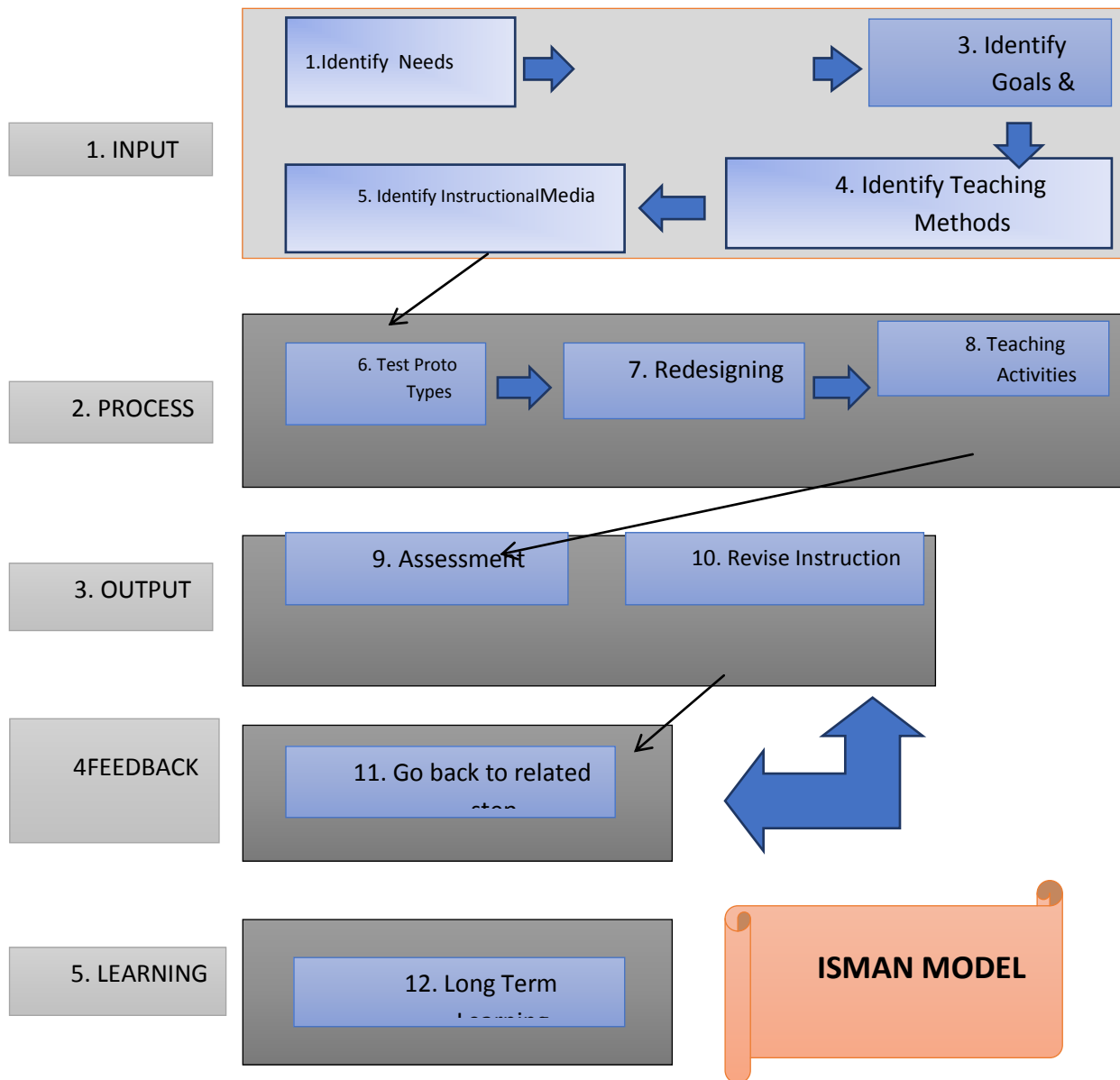


Figure 1. Isman Instructional Design Model (Isman, 2011, p. 139)

Figure 2 is the model for validating in learning modules. The input is the developed learning modules. The process that was employed in this module was the pre-test / post-test experimental design. The learning modules were used by the experimental group as a teaching methodology and its effectiveness was compared to the controlled group who were exposed to the traditional lecture method. The output of this model is the measure of effectiveness of the validated learning modules in servicing mechanical system.

Research Paradigm

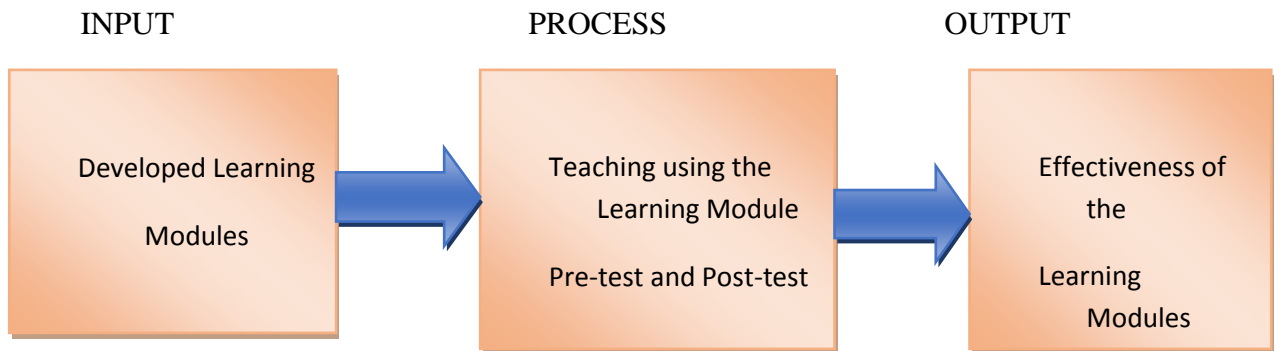


Figure 2. Model in Validating the Learning Modules

Statement of the Problem

This research study aimed to develop and validate learning modules in servicing mechanical system. Specifically, it sought to answer the following questions:

1. How do Automotive Technology experts evaluate the module along the following quality elements?
 - a. suitability of learning objectives
 - b. clarity of Instruction and test items
 - c. modules suitability and content
 - d. modules sequence and layout
 - e. modules timing and phasing
 - f. modules suitability of approach
2. What is the pre-test score for both the control group and the experimental group?
3. What is the post-test score for both the control group and the experimental group?
4. Is there any significant difference in the pre-test scores of the students exposed in the traditional and modular approach of teaching?
5. Is there any significant difference in the post-test scores between the control group and the experimental group?
6. What is the average normalized gain score of the students in the control and experimental group?
7. Is there a significant difference on the normalized gain score of the students in the control and experimental group?

Research Hypotheses

1. There is no significant difference in the pre-test scores of the students exposed in the traditional and modular approaches.
2. There is no significant difference in the post-test scores of the students exposed in the traditional and modular approaches.
3. There is no significant difference in the normalized gain scores of the students exposed in the traditional and modular approaches.

Significance of the Study

The researcher, being aware of the problems encountered in teaching Automotive Technology, had undertaken the initiative to develop learning modules, the following would hopefully benefit from the result of the study.

Students. They are the ultimate beneficiaries of this study, the learning modules would help facilitate the study and learning of the subject. It gives the students the basic knowledge needed to achieve a better understanding that they may be given a chance to improve their academic performance and technical knowledge in Automotive Technology.

Teachers. The learning modules developed in this research study will inspire the teachers to come up with their materials. Future teachers could also use the developed modules in their respective classes. They could also develop their learning modules on the topics that needs further enhancement.

Administrators. This study would serve as a guide for the enrichment of the curricular offering in Automotive Technology. The developed modules will serve as additional instructional materials, thus, cope with the demands of quality education.

Researchers. The study would serve as a guide in teaching the subject effectively. Likewise, it would also serve as a guide to improve the performance of students. This study will inspire the future researchers to develop and validate learning modules in the different fields to come up with better ways to improve the quality of education.

Curriculum Planners. The result of this study may serve as basis for curriculum planners in Automotive Technology in their planning activities for curriculum development. The validation of modules becomes feedback for curriculum planners and used in deciding whether to continue, modify or eliminate the curriculum plan.

Scope and Delimitation

This research study was focused on the development and validation of learning modules in Automotive Technology particularly in servicing mechanical system to the Isabela State University, City of Ilagan campus. The following modules were developed:

Module 1 - Service Cooling System

Module 2 - Service Lubricating System

Module 3 - Service Fuel System

The testing of the effectiveness of the proposed learning modules is limited to one class of the researcher from the Bachelor of Technical Teacher Education major in Automotive Technology at the College of Industrial Technology and Education of Isabela State University, City of Ilagan Campus during the Second Semester of the School Year 2016 – 2017. The learning modules were used as an experimental instructional material of the experimental group. Its effectiveness was measured by the learning gain of the students as indicated by the pre-test / post-test scores of the two groups of respondents.

Definition of Terms

The following terms are defined for this research study.

Learning Modules – These are student-centered instructional package which consists of learner's activities to facilitate the teaching-learning process for a particular topic.

Learning Objectives– These are the criteria used in evaluating the learning modules. It deals with how the learning objectives have been stated in the learning modules.

Directions – These are the criteria used in evaluating the learning modules used by experts. It deals with the specific instructions of the learning activities in the learning modules.

Materials– These are the criteria used in evaluating the learning modules. It deals with the complete package of the learning modules which includes the content and topics.

Pre-service Teachers–It refers to the students enrolled in the College of Industrial Technology and Education particularly in the Bachelor of Technical Teacher Education program who already passed the qualifying process.

Experts. This refers to the Automotive Technology teachers who validated the learning modules.

College of Industrial Technology and Education. A unit of the Isabela State University mandated to develop future teachers in the technical teacher education.

Control Group. It refers to the Automotive Technology students who were taught using the traditional method of instruction.

Experimental Group. It refers to the Automotive Technology students who were taught using the developed learning modules by the researcher.

Gain scores. It is the difference between a students' performance on a test and his performance on a previous administration of the same test.

Pre-test. It refers to a set of test items which used to determine the performance of students prior to the administration of the learning modules and conduct of traditional method of instruction.

Post-test. This refers to a set of test items administered to the two groups of students after completing the lessons on the selected topics. In this study, it consists of 20 items in each of the three modules.

Validation. It is a mode of assessment of the learning modules to test its effectiveness.

Effectiveness. It refers to the enhancement of learning or learning gained by the Automotive Technology students using the developed learning modules of the researcher.

Summary of Findings

Module's Suitability, Content, Layout and Effectiveness According to Experts

The authorities or pool of experts who were in-charge of the veracity and appropriateness of the modules were found to be highly consistent as indicated by the inter-rater consistency using intra-class correlation coefficient of 0.968. The experts determined and strongly in accord, having means of greater than 4.20, that the modules consisting of three lessons are well-planned and designed, constructively aligned, readable, suitable, appropriate, and effective.

Pre-test Performance

Students on both instructional approaches demonstrated around 43%-44% before the actual teaching of the three lessons. In general, they fairly demonstrated similar level of expertise about the lessons.

Post-test Performance

Findings divulged that students in modular set-up were able to attain around 85% mastery rate against 66% of students who were inside a class, which endorsed chalk-and-chalkboard method. By lesson, students in both groups performed the best in Lesson 3-Lubricating System. The comparison group accomplished the least level in Lesson 2-Fuel System while in Lesson 1-Fuel System for treatment group.

Mean Difference of Pre-test and Post-test Performances

Students who were able to utilize the module and those who did not were evidentially of equal footing along the three lessons before the conduct of the study, $p > .05$. After the instructional execution however, students who experienced modular instruction acquired a remarkably better performance, $p < .05$, in all three lessons.

Learning Gain

Both groups, the control and experimental group illustrated evidence of progress after the execution of the three lessons in Automotive Technology. It is further shown that the students in both groups were able to receive, respond and internalize the most in Lubricating System, then in the Fuel System and least in the Cooling System. The results also suggest that heterogeneity is of no issue among two groups.

Mean Difference of Learning Gains

Students who were taught using traditional set-up and module both improved meaningfully and significantly, $p < .05$. Students in the modular instruction was able to make a greater leap though.

Conclusions

1. The modules covering the lessons in cooling, fuel, and lubricating systems are well designed and planned, suitable, readable, effective and reliable instructional materials.
2. Students in both groups demonstrated similar level of entry knowledge but student who utilized modular instruction reveal a higher exit knowledge than those who utilized traditional instruction.
3. Modular instruction is an effective delivery method in teaching lessons in servicing engine mechanical System specifically the cooling system, fuel system, and lubricating systems.

Recommendations

1. Teachers and students may consider modular instruction as an alternative learning delivery mode in teaching servicing engine mechanical specifically on fuel, cooling, and lubrication systems.
2. Teachers who plan to use modular instruction are advised also to contemplate contributing factors of success in the utilization of modular instruction like learning styles, provisions of skill development, styles and techniques of execution among others.
3. School managers may consider institutionalizing and operationalize instructional material development and usage in its curriculum among its faculty members to increase material database.
4. For future researchers who plan to replicate the study, they may consider the external and other internal factors and they should extend the scope of the lessons to provide conclusive results on the use of modular instruction.

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