# Students Exposure in Fabricating the Faculty Research/Innovation titled " Modified Smoke House" to Augment their Practice Skills in Welding and Fabrication

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## ABSTRACT

Experience learning method in teaching Automotive Technology 100 (AT 100 - Automotive Hand tools, Equipment, Power Machines & Bench Work Operation) ignite the creativity and inventiveness of the students. A faculty, researcher and innovator of the different types of smoke house device strategized the fabrication process of his innovated devices as exposure of the Bachelor in Automotive Technology first year students in their basic welding and fabrication course. The exposure of the students enhances their capability in crafting new ideas and operation of machines/equipment as avenue in developing new things. They appreciate the importance of using protective gears and equipment that involve in fabrication such as: grinding, drilling, cutting, welding (Arc and Oxyacetylene) and lathe machining. As a result, the students acquire easily the skills in basic full weld position (flat, vertical, horizontal and under position) and they excel in their given task/projects as required by the subject in terms of designing and fabricating things that emanate from their imaginary minds. Their outputs range from miniatures like robots to cars and the like out of scrap/recycled materials found in the Automotive laboratory area. Their outputs could be exhibited during college's foundation day or any occasion highlighting academic activity of the students for others to see and appreciate. The involvement of the students during the mass production of the generated technology as research output of the college is highly recommended for inclusion in the curriculum.

Keywords: **Experiential learning, exposure learning, innovative learning**

## Rationale

The Mariano Marcos State University-College of Industrial Technology offers three major programs, namely: (Bachelor of Science in Industrial Technology (BSIT), Bachelor of Technical Teacher Education (BTTE) and Bachelor in Automotive Technology. Both the curriculum of BAT and BTTE offer subjects with basic welding and fabrication process. The subject is handled by the four automotive instructors of the Bachelor in Automotive Technology Department of the said college in a round-robin basis every Academic Calendar Year. For the previous years, the instructors used the traditional way of teaching the subject which is lecture, demonstration, actual practice, conducting examinations and project output specifically on the four full weld position of welding such as flat type, horizontal type, vertical type and under type. This welding technique and skills can be taught using actual equipment like welding machine, lathe machine, portable angle grinder, oxyacetylene and cut off machine or circular saw and other hand tools or hand/mechanical type machine. This subject also requires supplies and materials such as welding rods, grinding disc, cutting disc, hack saw blade, sand paper, Personal Protective Equipment (PPE), angle bars and metal sheet plate. These supplies and materials supposedly acquired and supplied by the school but due to a long and very complicated PPMP procedure for the procurement of the same in the University, the supplies and materials usually arrive or available only at the end of the semester with often times some lacking. This scenario creates a big deal between the instructor and the students taking the subjects. The situation of PPMP process are always explained by the instructors to the students. The only remedy is the students procuring their own supplies and materials for them to catch with the time frame. After their practice in welding, they are required to submit their output on the four full weld position with different joints using angle bars and metal sheet plate such as lap joint, butt joint and T-joint. This learning process is very costly for the students.

Blessing in disguise that one of the automotive instructors of the department devoted in research and innovation. He strategized the learning process of the students taking up welding and fabrication subjects to undergo welding practice in the fabrication area of smoke house. His eagerness to fabricate models of smoke house inspired by a key note address from President Gloria Macapagal Arroyo when she was still a Vice President of the country :

*"Our fisheries export situation has great potential despite. The competition from other countries. Moreover, we are under a global regime where health, safety and sanitary standards must be complied with to ensure better trade relations. Thus, better post harvest technology that can lessen wastage and maintain world class quality and health standards. For fishery products should be developed by science. And made available to the fisheries industry".*(Proceedings of the National Symposium cum Techno Fair on Postharvest Fisheries Technology,1999).

From 2003, he started innovating smoke house device and up to the present he has already different four models duly registered and patented with the Intellectual Office of the Philippines. The College set a portion of the old automotive building as fabrication area of the device. ( The building was already demolished this year for the structure of an state-of-the art technology building). His innovations won several awards that is the reason why the college labeled him as the most multi-awarded instructor and recently, again, he won the first prize award on his research titled "Modified Smoke House" during the Regional Invention Contest and Exhibits (RICE) conducted at Robinsons Ilocos, Ilocos Norte, Philippines conducted by DOST-TAPI on November 14-16, 2017. He automatically shall represent the region for the National Invention Contest and Exhibits ( NICE) for the succeeding year.

Allowing the students to practice in the fabrication area may compromise the flow of the fabrication but due to his willingness to transfer welding skills to the students at low cost manner,

he planned to expose them in the different fabrication process of smoke house. As Gage (1978) presents the idea that there is a scientific basis for the art of teaching. He views teaching as a useful or practical art which "... must be recognized as a process that calls for intuition, creativity, improvisation and expressiveness..."

During the first semester of Academic Year 2016-2017, the instructor strategized his teaching process in the welding subject by adapting " out of the box modality in teaching" and allowed the students to have their actual practice in the fabrication area of the smoke house. This strategy aims to find out the students' creativeness through their project output as one of the requirements of their welding subject, hence the conception of this study.

**Objectives:**

The study intended to expose students in the fabrication of the faculty research/innovation entitled
" modified smoke house" to augment their practice skills in welding and fabrication at low cost. Specifically, it aimed to:

1. guide the students in using power tools, hand tools, PPE (personal protective equipment) and welding techniques;
2. expose the students in reading linear measurements and fabrication process of smoke house;
3. require students to innovate new things out of the scrap materials found inside the fabrication and automotive laboratory area.
4. document the study for future reference of other technology instructors.

**Significance of the Study**

Generally, the study is seen by the researcher as an alternative step to ignite the inventiveness skills of the students and be a model to other instructors that an effective learning takes place not only through using scientific methods of teaching or the traditional way. The real knowledge and skills of a certain students may be brought out and enhanced through devotion and creativeness of teaching style by a teacher. Palmer (1990)

This is strategizing learning can be adopted by ordinary teachers teaching welding process especially those involved in technology researches. Collaboration of research study may not only be limited to faculty and staff of the college but certain students' involvement in such activity may contribute new ideas.

With this research, instructors in automotive technology is given a break from their traditional way of teaching wherein they just focus of what is common and of what is available in the four corners of the classroom. This research may be considered as two in one projection that the instructors may do their four-fold functions in the school system which is instruction, research, extension and production and while doing research they may use their output as a tool to transfer knowledge and skills to students.

To the students, this research makes them at ease in terms of financial matters concerning on supplies and materials cost and this serves as an avenue for them to be creative and appreciate innovation process.

**Scope of the Study**

This study was limited to the Bachelor in Automotive Technology first year students and Bachelor in Technology Teacher Education first year students major in automotive technology at

the Mariano Marcos State University- College of Industrial Technology, Laoag City, Ilocos Norte. The study focused on the submitted projects of the students out of scrap as an evidence of their acquired skills in welding during their exposure in fabrication process of smoke house instead of submitting output from traditional way of teaching welding and fabrication like the T-Joint, lap-Joint but joint and others using expensive metals.

The actual exposure started during the start of the first semester of Academic Year 2016-2017 and ended one month before the final exams for the students to have enough time to work on their technical creations out of scrap materials found in the automotive laboratory and smoke house fabrication area.

One week before the final examination during the first semester, the students were directed to submit their output projects and the instructor collated, evaluated and provided remarks or observations and recommendations. Their projects will be kept securely ready for exhibits during college's foundation day or any occasion highlighting academic activity of the students for others to appreciate.

**Review of Literature**

This study is theoretically based on the foundations for refining instructional practice.

Saskatchewan Education (1985) One of the purposes of education is to provide children with the skills and knowledge needed to function capably as adults. With the world changing rapidly, the abilities acquired in schools today need to be reassessed, as do the ways in which students are expected to learn... And when the content of the curriculum changes, ways in which the curriculum is delivered must change correspondingly.

Teaching is an art as well as a science. educators need to achieve balance between the two. Palmer (1990) in speaking about the art of teaching states that educators: *...misconstrue mystery when we think of it as a 'black' something opaque and impenetrable that we must either avoid or manipulate by main force... Good teachers dwell in the mystery of good teaching until it dwells in them. As they explore it alone and---~ with others, the insight and energy of mystery begins to inform and animate their work. They discover and develop methods of teaching that emerge from their own integrity (p.11).*

Teachers should see themselves as instructional decision-makers. They must have a sound knowledge base of teaching, a repertoire of instructional practices, and the abilities of reflection and problem-solving (Arenas,1988). Most teachers agree that they should become more familiar with reaming styles and that they could do more to match teaching with reaming. Henson (1988) asserts that teachers need not always accommodate student preferences. Students, he notes, should experience a variety of styles.

Teaching as decision making. Planning a unit or lesson involves a number of instructional decisions. The teacher must identify the following: the content and processes to be addressed, the strengths, needs, and interests of students, the Common Essential Learning's that could be incorporated, and the most effective instructional approaches, such decisions are critical and must be made consciously and purposefully.

As Glickman (1991) states:

"Effective teaching is not a set of generic practices, but instead is a set of context-driven decision about teaching. Effective teachers do not use the same of set of practices for every lesson...Instead, what effective teachers do is constantly reflect about their work, observe whether students are learning or not, and, then adjust their practice accordingly".

Experiential learning is inductive, learner centered, and activity oriented. It is and effective instructional strategy if direct or 'hands-on" experience is needed before teaching methods that involve iconic learning or symbolic learning. Experiential learning greatly increases understanding and retention in comparison to methods that solely involve listening, reading, or in viewing (McNeil & Wiles, 1990). Students are usually more motivated when they actively participate and teach one another by describing what they are doing. The emphasis in experiential learning is on the process of learning and not on the product. a teacher can use experiential learning as an instructional strategy both in and outside the classroom.

Experiential learning occurs when learners: participate in an activity; critically look back on the activity to clarify learning's and feelings; draw useful insights from such analysis; and, put learning's to work in new situations. (Pfeiffer& Jones, 1079).

**Conceptual Framework**

As being stated by the above scholars under the related literatures, a teacher needs to strategize his method of teaching. The art and science of teaching should always be adopted both by a teacher in his/her daily teaching activity.

In general, teachers are only limited to expound what are indicated in the syllabus. They just simply follow literally the activity required by the syllabus and use only available teaching tools and equipment, while others opted to jump to other topics in the syllabus if laboratory tools, equipment, supplies and materials are not available.

College teachers are bound to conduct four-fold function such as instruction, research, extension and production but in reality, most of them are focused only in instruction. The irony is research is the foundation of all things that instruction activity is using. Generated outputs from research are the things used on extension programs, and research output usually resulted to mass production which will serve as income generating project of the college.

This study was conducted to serve as eye-opener to teachers especially those handling technology subjects in the college to be active in the four fold function as their main duty and responsibility.

**Methodology**

The instructor took one month to inculcate the required theories to the students as a pre-requisite in basic welding process. He used lecture and demonstration mode of learning process supported by print media (books, leaflets, hand books and manuals in welding,) and non-print media ( CD's of Shielded Metal Arc Welding NC 2 training, movies of fabrication, power point in welding process).

First, students were toured in the fabrication area and introduced to them by the instructor the tools and equipment necessary in the practice of basic welding strategies. Second, instruction were given on the proper use and handling of SST tools and they were reminded the “do’s and don’ts” inside the fabrication shop. Before the final exposure of the students for at least two months in the fabrication shop of smoke house, they were asked to bring their own PPE. The BTTE and BAT students had their separate session schedules.

During the exposure activity, students were given the chance to hold and operate all the equipment, and power tools intended for fabrication. Free supplies and materials from the stocks of smoke house production were given to them for simple test run and practice of all the equipment with the guidance of the instructor. A round robin and mentoring technique was implemented during the practice in order that fabrication of smoke house will not be compromised especially on

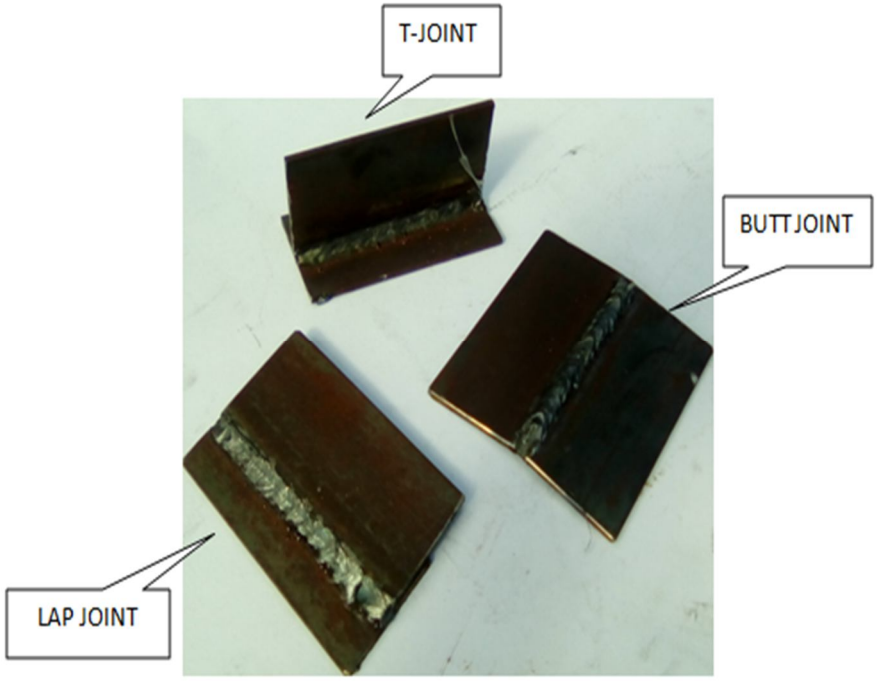
the date of delivery. Students who have shown advance skills in welding were selected to spearhead the fabrication and assembling process of the smokehouse parts. Slow learners are encourage to focus on flat full weld position until they adapt and have a mastery on the welding craft. Pulse control is very important in acquiring individual technique in welding. After they adapt the welding technique, they were exposed to lay-outing, reading linear measurements and using specialized tools. The instructor required the students to master basic fabrication process before their exposure to a more rigid fabrication process.

With the multiple steps in fabricating a unit of smoke house, almost all the students were assigned individual task during the fabrication. Some were grouped considering that there were parts of the smoke house project that needed a couple hands especially at the finishing touches stage of the project.

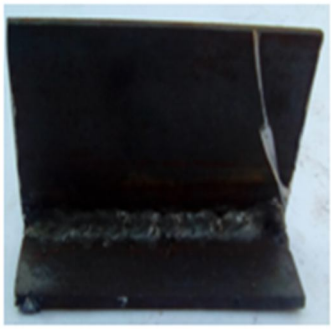
After their 2 months exposure, the instructor assigned the BTTE students to group into two while the BAT students had the work individually and were required to fabricate any things that cropped out from their mind using scrap materials found inside the fabrication shop and in the automotive laboratory shop. They may use unusable engine parts/automobile parts, scrap flat bar, angle bar, round bar, MS plate, G.I sheet. They were given free use on the equipment in the fabrication shop as long as the shop is vacant. While others can use the intended laboratory equipment for welding and fabrication subject in the automotive laboratory shop. They were given one month to finish their given project and present their output one week before the final examination.

**Output/Results:**

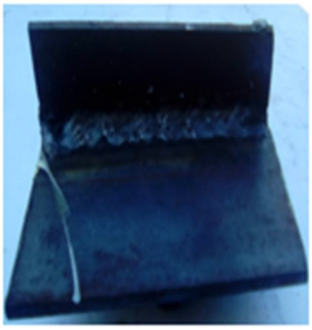
The following photographs are the common types of joints done through full weld which were used traditionally by the automotive instructors for acquiring the basic skills in welding:



The following photographs are the different positions used traditionally by the automotive instructors during the welding practice of the students:



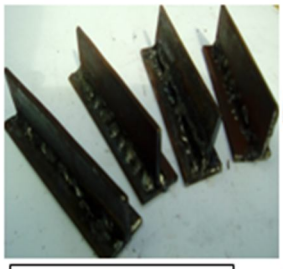
FLAT POSITION



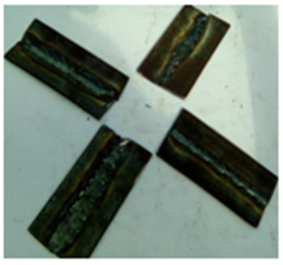
HORIZONTAL POSITITION

VERTICAL POSITION

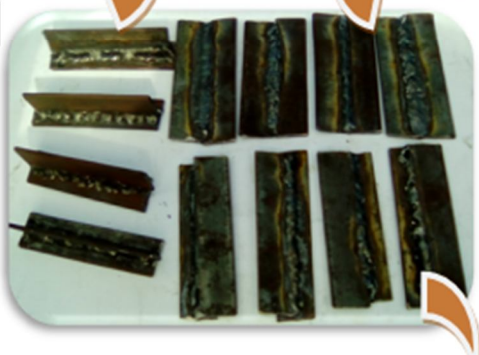
UNDER POSITION

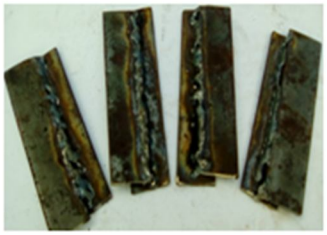


T-JOINT FULL WELD



FLAT FULL WELD





LAP JOINT FULL WELD

The following photographs are the students in action during their exposure in smoke house fabrication:

The following photographs are the creative output of the BAT and BTTE first year students submitted to the researcher after their exposure in welding and fabrication of the smoke house device as a requirement of their welding and fabrication subject:

Output of the Bachelor in Automotive Technology students out of motorcycles scrap.

Output of the Bachelor in Technology Teacher Education students out of internal parts of automobile engine scrap.

**Conclusion and Recommendation:**

As evidence, the exposure of the students in the fabrication process of smoke house benefited them the necessary basic skills in welding. The traditional way of learning the welding and fabrication subject through using flat bars and angle bars to form as T-joint, Lap joint and butt joint which is very costly for both the school and the students was no difference when the strategy used was their exposure to real fabrication activity. They were given great avenue to exercise their creativity and their outputs could be exhibited during college's foundation day or any occasion highlighting academic activity of the students for others to appreciate.

The involvement of the students during the mass production of all the generated technology as research output of the college is highly recommended for inclusion in the course syllabi such as AT 100.

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## BIOGRAPHICAL NOTE

The researcher is a graduate of BS in Industrial Education in 2000 and MAEd-Technician Education in 2006 at MMSU, Laoag City. He entered as Instructor in 2000 at MMSU-College of Industrial Technology. At present he is an Associate Professor II with college designation as department chairman. He was a winner of various research symposia and only recently, he was the regional and first prize winner during the Regional Invention Contest & Exhibits -DOST I &TAPI with his research "Modified Smoke House conducted on November 14-16, 2017 at Robinson's Place, San Nicolas, Ilocos Norte.