Landscape of Electronics Instruction: Teachers’ Teaching Difficulties and Coping Strategies

Abstract: Electronics course is one of the vital components of Technical Vocational and Livelihood strand of the K to 12 Curriculum. As such, evaluation of the electronics instruction is vital. In such light, this case study explored the teaching difficulties and coping strategies of two electronics teachers. The interviews with teachers and learners, classroom observations, and focus group with the learners revealed that difficulty in dealing with diverse learners and lack of teaching resources are the identified difficulties of the teachers. With these difficulties, using varied learning activities and buying or borrowing instructional materials are the coping strategies of the teachers. Therefore, this study posits that successful electronics instruction is dependent on capability of teachers to deal with the diversity among learners and the availability of learning resources.

Keywords: classroom management, Department of Education, electronics technology, individual differences.

INTRODUCTION

Background of the Study

Technical Vocational livelihood (TVL) is one of the tracks offered in Senior High School. It focuses on technical skills development in any area. Five common competencies, based on the training regulations of the Technical Education and Skills Development Authority (TESDA), are covered in the exploratory phase: mensuration and calculation, technical drafting, use of tools and equipment, maintenance of tools and equipment, maintenance of tools and equipment, and occupational health and safety (Sun.Star, 2018).

TVL offers broader choices and also subjects that are already TESDA accredited. In TVL course the students can also acquire National Certificates in different levels and in accordance to guidelines set by the Department of Education (DepEd) and TESDA. One of the major fields under TVL where learners manipulate and use tools and equipment is electronics.

Electronics deals with electronics components. These electronic components include resistors, transistors, capacitors, diodes, inductors, and transformers. Electronics also concerns the measurement of voltage, current, and resistance in the assembled working circuit (Paull, 2017). If one takes this course of study, he or she may be offered many chances in the government and the private field sectors because of the significance of electronics technology in most modern and advance technologies that are being used at work.

Furthermore, electronics and electrical technology are fields of study that provide both theoretical and hands-on knowledge of current electrical and electronics devices and circuits, it also provides students with fundamental knowledge and skills for the workplace and professional pedagogy skills in electrical and electronics technology (Carribean, 2001). Nonetheless, electronics or electrical technology equips student with knowledge, skills and attitudes needed for performance in the field of electronics or electrical technology and for gainful employment (Bird, 2009).

In electronics, learners gain knowledge and acquire skills such as solving complex circuit problems, using different electronics tools, and designing or make their own electronics tools and materials which can be helpful in their day to day life.

On the other hand, Dahmoun (2017) underscored that teaching electronics is not only for electrical and electronics students but also for mechanical, aerospace, engineering design, civil and engineering mathematics programs, which are likely to have electronics units as part of their curriculum. Accordingly, to teach electronics for these non-electronic programs is very challenging in many aspects because of four reasons. First, the electronics unit has to satisfy the learning outcomes for each program. Second, the student’s motivation is normally very low since electronics is not career the students would like pursue. Third, the timetabling can be an issue when a large number of students enrolled. Finally, a method of assessing this large number of students has to be put into place. Nonetheless, teaching electronics to an aerospace engineer with a very limited number of credits has been a major challenge (Gil- Sanchez, Masot, Alcaniz 2015).
In addition, Nyirongo (2009) stated that electronic technologies like computers and internet continue to spread to all parts of the world. Her study revealed the prevailing levels of utilization of computer technology in teaching and learning at the university. She also uncovered factors that facilitate or hinder use and integration of the technologies in teaching and learning electronics courses.

Meanwhile the demands for electronics teachers and experts have increased substantially in education and industry sector. In fact, the DepEd is continuously hiring teachers for TVL program because of the K to 12 Curriculum. However, problem and challenges can be observed in teaching electronics.

Base on observation, teachers have difficulties in teaching because of lack of materials, equipment or tools in laboratory classrooms. The ratio of learner’s equipment or tools adds to their difficulty. Teachers give laboratory activities on a staggered basis. Most of the time paper works are given.

In laboratory activities, learners are not performing well in their activity because of lack of equipment leading to loss of interest among learners. Also, teachers cannot deliver properly their lesson because of lack of teamwork and support between students and teachers. Last learners cannot individually perform laboratory activities; hence, most activities are group work.

With the fervent hope to help in improving the quality of instruction and training in electronics classes, the researchers found it imperative to investigate the difficulties and coping of electronics teachers in teaching electronics courses. Also, the researchers wanted to confirm their observations on the current scenario of electronics instruction in their practice teaching site. Through this study, the researchers aimed to provide bases for any mitigation actions or interventions that the target school can do to address the findings of the study. Most importantly, this study aimed to provide additional literature in the field of electronics and educational researchers.

Statement of the Problem
This study aimed to describe experiences of teachers in teaching electronics courses in the junior and senior high school. Specifically, it sought answers to the following questions:
1. What difficulties do teachers face in teaching electronics courses?
2. How do teachers cope with their teaching difficulties in teaching electronics courses?

**METHODOLOGY**

Research Design
This qualitative study employed case study as its research design. Creswell (2007) mentioned that a case study research is a qualitative approach in which the investigator explores a bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information (e.g., observations, interviews, audiovisual material, and documents and reports), and reports a case description and case-based themes. Accordingly, the focus of case study is to develop an in-depth description and analysis of a case or multiple cases. Nonetheless, the researchers found the design appropriate since the cases which were studied were the teaching difficulties and coping strategies of teachers in teaching electronics courses.

**Selection and Study Site**
The study was conducted in one national high school in Ilocos Sur, Philippines. The main participants were chosen using criterion sampling in which three criteria were set. First, they are handling electronics courses for at least one year. Second, they are holders of National Certificate II in electronics. Third, they are willing to be interviewed and observed. With the criteria, two electronics teacher were identified. Finally, the learners who were enrolled in the electronics courses handled by the identified teachers were considered as participants in the triangulation process.

**Data Gathering Instrument**
In gathering the data, aide memoir was used. The aide memoir contained questions that were lifted from the interview guide that contains a priority codes. The aide memoir was used to encapsulate the teaching difficulties and coping strategies of the teachers. The interview questions were validated by research adviser of the researcher. Further, observation schedule or a guide which was based on the result of the interview was also use in triangulation process. Last, interview and observation consent form was used to get the consent of the participants in participating in the study.

**Data Gathering Procedure**
In gathering the data, the researchers first constructed the interview guide before constructing the aide memoir. After making the aide memoir, the participants were identified through criterion sampling. Next, permission to conduct the study was sought through a letter to the school principal. Then, the consent of the participants was asked using interview and observation. The nature of research was also explained to the participants before the interview and observation were scheduled. Then, interviews were conducted.

After interviews were successfully conducted, the researchers transcribed the recorded interviews, and returned to the participants for the validation of the data; hence, employing member checking technique. Spot checking was also done for correctness and accuracy of data. Then, result of the interview served as guide in the observation. Focus group with the learners was also done to triangulate and substantiate the
gathered data. Finally, qualitative analysis was done in the analysis and interpretation of the gathered data.

Mode of Analysis
In order to arrive at extended texts, the interview recordings were transcribed by researchers for more accurate transcriptions which were read and reread. During the cool analysis, anchors and phenomenal referents were marked to facilitate the identification of themes within the text (de Guzman & Tan, 2007). In the warm analysis, highlighted words or phrases were proof-read and analyzed to formulate categories and themes (Valdez et al., 2012).

To establish the validity, truthfulness and trustworthiness of the emerging patterns, member checking procedures were done to ensure the truthfulness and trustworthiness of the data (de Guzman & Tan, 2007). Finally, the member checking included returning to the participants the copies of their interview transcripts for their signature after checking the correctness and accuracy of entries.

RESULTS AND DISCUSSION
Findings
Electronics course is one of the vital courses that Technology Vocational and Livelihood strand offers. In such case, continuous evaluation of this course is needed. As such, this study looked into the teaching difficulties and coping strategies of electronics teachers. The result of the cool and warm analyses generated four themes as answers to the posted problems: Learner’s Diversity, Lack of Resources, Use of Varied Activities, and Use of Alternatives. The first two themes served as the answers to first problem of this study. The last two themes served as the responses to the second problem of the study. With these themes, the 2Ls and 2Us in teaching electronics courses were formulated.

Learner’s Diversity. In the conducted interviews, the participants highlighted that they have difficulty in dealing with the diversity of their learners. This diversity was explained as a factor that makes teaching difficult because of the need to make necessary adjustments in the teaching process. In such light, the first theme was formulated. As stated:

“It’s very hard to deal with students. They come from various backgrounds.” (T1)

“Because of the diverse learners…Their characteristics that very hard to understand something.” (T2)

The findings conform to Al Muhaidib’s (2011) articulation which stated that earners come from different social and educational backgrounds and differ in strengths and weaknesses, interests, ambitions, senses of responsibility, levels of motivation, and approaches to studying. As such, understanding the individual needs of today’s learners and developing instructional methods to meet those needs are required to ensure both quality and progress (Felder & Brent, 2005).

Meanwhile, the above verbalizations were also confirmed during the observation in which learners portray various behaviors and attitude towards the subject matter and activities. Their reactions and attitudes towards the subject matter and activities sometimes delay the completion of the lesson. In such case, the lessons were then continued in the succeeding days.

Furthermore, the focus group with the learners revealed the same findings. As stated:

“Sometimes he cannot handle us because we are different from one another. Like some come from different places.” (S1)

“The factors that may …our teacher have difficulty in achieving our lesson is us. Most of the time, our differences is you know… the reason.” (S2)

“Most of time us coz (because) we have different attitudes and behaviors.” (S3)

“The factors or things that make your teachers have difficulty in achieving our lesson objectives are students factor, like behavior, attendance, attitudes...” (S4)

Above all, the difficulty in dealing with diverse learners implies that teachers need to be equipped more innovative and creative teaching styles in order to manage and minimize the possible effects of learners’ differences. Also, the finding reveals a compelling action to minimize the effects of learners’ diversity while looking for long term solutions. Most importantly, the identified difficulty if not handled well subjugates the success of the teaching-learning process.

Lack of Resources. Resources in the teaching-learning process under electronics courses include tools, equipment, facility and among others. These resources serve as one of the main factors that make the delivery of quality training and education possible. However, the verbalizations of the participants revealed that they lack materials, tools, and equipment that they can use; this characterizes the second theme. As verbalized:

“One specific barriers or difficulties in teaching are those to cope up with the trends in technology; we are dialing technologies in electronics, the trends somehow, we are difficult to coped up because the tools and equipment are not available in our locality. We can’t cope up because we lack the facility and equipment.” (T1)

“Include the lack of materials, equipment and tools that is why it’s hard to teach what we need to teach.” (T2)

The mentioned verbalizations were substantiated through the results of the class observations. Noticeably, each laboratory activity was performed by each group one after the other. As a result, one
The availability of tools, equipment, and facility could last for one week given the lack of instructional materials, like lack of modules and textbooks. "We have problems because the tools or materials are not enough." (S5)

In fact, Intal (2018) stated that buildings, facilities, and supplies are lacking in some junior high schools. In 2016, the Department of Education (DepEd) data showed shortages that the agency is yet to meet; the shortages included 13,995 classrooms, 88,267 teachers; 235 million instructional and other learning materials; 2.2 million school seats for 2016 and 66,492 sets – each seat with 45 seats and 1 teacher’s desk, and 44,538 computer packages (Umil, 2017). Hence, the lack of imperative resources can be equated to poor delivery of electronics instruction among learners especially that it involves the use and manipulation of highly technical and advance technology. Likewise, Vizconde (2015) identified the emerging concerns on the implementation of K-12 curriculum which include the insufficient resources for the implementation.

With the stated difficulty on availability of resources, the marriage between learning resources and instruction cannot be undermined. These two aspects of electronics instruction manifest congruent if not parallel relationship. The absence of the latter has adverse effects on the former which needs to be avoided. As such, continuous evaluation and calibration are imperative not only on the part of the school officials but also on the teachers who serve as one of the learning resources.

**Use of Varied Activities.** In responding to the difficulty in dealing with diverse learners, the participants underscored the need to use varied activities to address the differences among their learners. This describes the third theme of the study. As articulated:

"I'm giving my students some activities that can make sure fill the gap of the lesson I gave to them. What I mean is give activities that fit their styles. Do not use only one technique." (T1)

"Use varied materials and teaching strategy to meet their needs and diversity." (T2)

In the triangulation process, the class observations revealed that the teachers used various learning activities like lecture, use of multimedia materials, making of portfolio, and use of remedial activities.

In this coping strategy, the first step in designing an effective instruction methodology is to identify student diversity in the classroom (Al Muhaidib, 2011). Student classroom learning depends on the student’s native ability, prior preparation, and compatibility as a learner and the instructor’s teaching style (Felder & Brent, 2005). It is not possible to design instruction according to individual needs, but it is also pointless to believe that a one-size-fits-all approach in teaching will be suitable for all students (Al Muhaidib, 2011). Hence, variation of learning activities is imperative in the successful electronics instruction.

**Use of Alternatives.** This study discovered that lack of resources is one of the teaching difficulties of the participants. As a result, they bring or barrow and buy materials in order to have instructional materials in their classes. This scenario describes the last theme of the study as the mitigation action of the participants in times of lack of resources. As verbalized:

"First thing is, I'm using my own money to provide tools and equipment's needed in my lessons, and next is ... I barrow also other tools and equipment." (T1)

"In the materials, just use some alternative materials. Barrow or bring the needed equipment or tools if possible. Sometimes, I use my money to buy those things." (T2)

Based on the result of the observation, some if not most of the tools and equipment needed during laboratory activities and lectures are not available. Also, the teachers barrow the materials from other teachers. Most of the time, the tools and material of the teachers are bought using personal money if not barrowed.

The result implies that successful learning, especially on laboratory activities, is reliant on the availability of resources and technology that are prescribed in the delivery of electronics instruction. Interestingly, using electronic materials in teaching is a great way to introduce and instruct students on their skills (Rekola & Savo, 2018). In fact, technology provides different opportunities to make learning more fun and enjoyable in terms of teaching same things in new ways (Savvidis, 2016).

Finally, the fact that teachers need to spend their money for and borrow or bring the instructional materials for the sake of quality training and education reveals the ignored reality in most public schools. With this reality, the demand for salary increase continues to flourish. Last, the finding airs the compelling and imperative need for the Department of Education to address the lack of resources among secondary schools in the country; hence, vindicating the teachers from financial burden or obligations of buying the needed resources for their classes.
Simulacrum of the Study

The teaching electronics course is a process that involves difficulties before its successful implementation. In such light, this study found the difficulties in electronics instruction together with the coping strategies of teachers. The inner circle is the context of this study, the teaching of electronics courses. The second layer is divided into two parts which depict the two teaching difficulties being met by the participants of the study: learner’s diversity and lack of resources. Finally, the last circle shows the coping strategies of the participants: use of varied activities for difficulty in dealing with diverse learners and use of alternatives for lack of resources.

CONCLUSION

The results of cool and warm analyses of the extended texts yielded the teaching difficulties and coping strategies of electronics teachers. The first difficulty of teachers is dealing with varied learners. They face this difficulty by employing varied activities that address the diversity among their learners. Meanwhile, teachers also suffer from lack of resources which include lack of tools, materials, and equipment as they prepare and execute their lessons. As a result, they borrow and buy the needed materials in order for them to facilitate a better teaching and learning experience for their learners. Nonetheless, these teaching difficulties post challenge to the Department of Education in general and to delivering schools in particular.

In terms of the diversity among learners, officials are challenged to design trainings and seminars that would expose the teachers to effective and innovative classroom management strategies. These strategies should be perpetuated across teaching field in all levels to establish habit formation among learners and most especially among teachers who serve as one of the primary movers of the educational realms. Likewise, teachers are then compelled to do profiling among their learners in continuous pace in order to better understand their diversities; hence, allowing them to implement better instruction to the learners. After all, teaching knows who the learners are and then all mechanisms follow.

Meanwhile, the lack of resources among delivering schools of the K to 12 Curriculum is not new scenario. Prior to the implementation of the said curriculum, the Philippine educational system has long been suffering from such problem. This results in poor delivery of education and training among learners. As such, mitigation or intervention programs should be formulated and implemented while working on long term solutions to problems on facility and equipment. The intervention programs include partnership with private, non-government and government agencies that could provide alternative and first hand learning opportunities to learners.

Finally, this study reveals various limitations that could provide directions for further studies. First, two electronics teachers were considered in this study. Future studies could deal with larger number of participants for better saturation of data. Second, this study focused on one study site. As such, future studies may consider including other public and private secondary schools. Last, the study was conducted in short period of time; hence, considering one school year instead of one term in conducting a similar study could be conducted to better document the scenario of electronics instruction in the K to 12 Curriculum.

REFERENCES


