DEVELOPMENT OF DEPED-TESDA COMPETENCY-BASED LEARNING MATERIALS IN COMPUTER SYSTEMS SERVICING

Development of DepEd-Tesda Competency-Based Learning Materials in Computer Systems Servicing

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Abstract

This research is about the development of DepEd-TESDA Competency-Based Learning Materials in Computer Systems Servicing. It is designed to enhance the academic performance of Grade 12 ICT students. The developed learning materials have their purpose, and it is for the students to be job-ready because their content is aligned with the industry standards, increases the employability rate, and provides the students with the knowledge and skills aligned with the competency standards. The developed learning materials were validated by the expert and passed the reliability test. After utilizing the learning material, students are ready to face the outside world. The participants of this research are the thirty-six (36) Grade-12 ICT students from Gov. Felicisimo T. San Luis National Agro-Industrial Integrated High School, 24 male and 12 female. Thirty-six Grade 12 learners in ICT-CSS participated in this study, who were selected through purposive or judgment sampling. This study used the following research instruments: (1) the developed DepEd-TESDA CBLM in CSS, (2) the validating tool of the DepEd-TESDA CBLM, and (3) the assessment tool (pretest and post-test). Weighted Mean, Standard Deviation, paired t-test, and Cohen's d were used as statistical tools to quantify the data. A consent letter was sent to the students, and approval from the principal was obtained before the utilization. This research is based on a quasi-experimental research design, specifically the one-group pretest-posttest design. This design only requires fewer participants. The results show that the academic performance has improved after using the DepEd-TESDA Competency-Based Learning Material, and it has a significant positive difference. As a conclusion, the research identified a positive outcome, and the researcher suggests that the utilization of the developed learning material will also serve as a teaching material for other teachers because it covers topics about Computer Systems Servicing that can help the students elevate their performance and be globally competitive, and pass the National Assessment of TESDA.

Keywords: *CBLM, TESDA, DepEd, learning materials, computer-based*

Introduction

In today's new normal, technology is rapidly improving, and, consequently, the need for skilled students and professionals in Computer Systems Servicing (CSS) has evolved progressively. In the Philippines, the Department of Education (DepEd) has its objective to let learners be ready for upcoming employment by giving competency-based learning materials (CBLM) aligned to the needs of the industry and business ethics. This research will focus on developing materials for computer systems servicing, specifically for the students of Gov. Felicisimo T. Luis National Agro-Industrial Integrated High School. By enhancing the quality of learning materials and resources, this research will ensure that students acquire the knowledge and skills necessary for the subject.

The Department of Education (DepEd) and the Technical Education and Skills Development Authority (TESDA) join forces to create active and effective learning materials. Still, gaps persist in the readiness and convenience of competency-based learning materials for computer systems servicing. According to Almazan et al (2019), most schools have a deficiency in consistent learning resources that are aligned with the needs of the industry. Likewise, Cruz and Rivera (2021) found that learners who engage in practical activities and simulations face numerous struggles due to insufficient learning materials, which prevent them from being adequately prepared for work or employment. Additionally, DepEd Order No. 21, series of 2019, orders the application of competency-based education; however, many teachers and educators still use outdated books and materials. (Department of Education, 2019). The purpose of this research is to address this gap by developing effective competency-based learning materials aligned with computer systems servicing.

This study is needed for many purposes. First, it aims to provide learners with the latest version of learning materials that are ready and aligned with industry standards. Second, to address the gap between the hypothetical practical skills and knowledge that educate learners' employability. Lastly, the study aims to provide more knowledge based on the competency-based way of education. It also provides benefits for educators, representatives, and learners. The expected results are to enhance learners' engagement, learning outcomes, and boost their confidence in meeting the industry's needs.

Research Questions

This study aimed to determine the effectiveness of the Developed DepEd-TESDA Competency-Based Learning Material (CBLM) in enhancing the Performance of Grade 12 Technical-Vocational-Livelihood (TVL)-Information and Communications Technology (ICT) students in Computer Systems Servicing (CSS). Specifically, it sought to answer the following questions:

1. What are the pretest and post-test mean scores of the Grade 12 TVL-ICT students?
2. What is the effect size of the DEPED-TESDA competency-based learning materials in enhancing the performance of Grade 12 TVL-ICT students in Computer Systems Servicing?

3. Is there a significant difference between the pretest and post-test mean scores of the Grade 12 TVL-ICT students?
4. What is the perceived level of effectiveness of the Competency-Based Learning Material as to;
    4.1. COMPONENT LEVEL
          4.1.1. objectives;
          4.1.2. content;
          4.1.3. activity; and
          4.1.4. assessment?
    4.2. CHARACTERISTICS LEVEL
          4.2.1. relevance;
          4.2.2. appropriateness;
          4.2.3. aesthetic value; and
          4.2.4. adaptability?
5. Is there a significant relationship between the perceived level of effectiveness of the students' performance in their post-test scores?

Literature Review

Students' academic performance in Computer Systems Servicing

The academic performance of the students is the top priority of the technical education educators. As technology continues to advance, the rising demand for skilled professionals in computer systems is being observed (Autor, 2015; Deming & Kahn, 2018; Carnevale et al., 2016). Quality education is what the students deserve for them to be successful in any career in the outside world. They should understand the purpose of understanding all the aspects and performances in Computer Systems Servicing.

Teachers' experiences in teaching Computer Systems Servicing

Several key issues and challenges arise in the utilization of ICT tools in the classroom for teachers. These include a lack of training (Ghavifekr et al., 2016; Dinc, 2019), infrastructure limitations (Sosibo, 2019; Sugiyono, 2021), support and maintenance deficiencies (Albugami & Ahmed, 2015; Alkahtani, 2017), cost concerns (Silviyanti & Yusuf, 2015), resistance to change (Howard & Mozejko, 2015), the digital divide (Adhikari et al., 2016), cybersecurity and privacy issues (Maqsood & Chiasson, 2021), curriculum integration challenges (Saxena, 2017), time constraints (Muslem et al., 2018), and the need for pedagogical adjustments (Gellerstedt et al., 2018).

Insufficient training may have been acknowledged by many teachers, leading to a lack of confidence and underutilization of technologies (Nikolopoulou & Gialamas, 2016). The proper use of technology can be hindered by insufficient or obsolete technology infrastructure, including hardware, internet connectivity, and software (Basak & Govender, 2015). Providing constant technical support can lead to improved reliability of supplementary materials and enhance the ability of each student. (Rahiem, 2020). The high cost of acquiring, progression, and maintaining ICT tools can present a barrier, mainly in underfunded schools or districts (Adarkwah, 2021).

Teaching Strategies in Computer Systems Servicing

An effective approach is required for teaching Computer System Servicing to ensure that technical content is learned and communicated by students in both academic and professional settings (Ventayen, 2018). To achieve this, various teaching styles and strategies should be employed to cater to the diverse needs of learners (Cuevas, 2015). One effective approach involves incorporating hands-on practical exercises, allowing students to apply the theoretical knowledge they have gained (Chen et al., 2020). Activities such as setting up computer systems, troubleshooting hardware and software issues, and simulating real-life situations are used to improve problem-solving skills.

Use of competency-based learning materials in enhancing students' performance

Growing popularity has been seen in competency-based learning materials in educational settings, offering a student-centered approach to learning (Manske, 2021). A targeted and modified learning experience is provided for students by focusing on specific skills and competencies (Cinque, 2016). Significant improvements in student performance and the development of general learning outcomes are likely to be observed as a result (Bliven & Jungbauer, 2021).

Methodology

Research Design

To achieve the research objectives outlined in the previous section, the researcher employed a quasi-experimental research design, specifically the one-group pretest-posttest design. The One-Group Pretest-Posttest design was used because it requires fewer resources compared to other experimental research designs and has a smaller sample size. It was also used to examine the effectiveness of the developed DepEd-TESDA competency-based learning materials in enhancing the performance of the Grade 12 students in computer systems servicing. Thomas (2024) explained that quasi-experimental research involves determining the relationship between cause and effect, considering the dependent and independent variables being studied. According to Allen (2017), this research design is two-fold.

First, there is a single group or section where all participants are in a single condition and are evaluated and treated equally. Second, a linear ordering, or pretest-posttest design, entails measuring a dependent variable before and after the intervention.

Since the study aimed to test the effectiveness of the proposed learning intervention, a quasi-experimental pretest-posttest research design is the most applicable. The application of the research procedures outlined in the research design yields a highly reliable result, as it primarily utilizes numerical representations derived from actual data collection.

Respondents

The study was conducted among Grade 12 students of Governor Felicisimo T. San Luis National Agro-Industrial Integrated High School in Brgy. Kapatalan, Municipality of Siniloan, Laguna. These Grade 12 students were taking up the Information and Communication Technology (ICT) strand under the Technical-Vocational Livelihood Track. There were thirty-six (36) SHS students enrolled in the said strand as verified by the school registrar.

Additionally, student participants came from one section taking up the Information and Communication Technology (ICT) strand under the Technical-Vocational Livelihood track, consisting of a total of thirty-six (36) students. These students are from Gov. Felicisimo T. San Luis National Agro-Industrial Integrated High School in Brgy. Kapatalan, Municipality of Siniloan, Laguna. Any evaluation of the accuracy and efficacy of the DepEd-TESDA Competency-Based Learning Material was limited to and directed at the research locale in question; it was uncertain whether such evaluations could be applied to other groups or educational institutions that were not a part of the research locale.

The participants of the study were chosen using a purposive or judgment sampling. This strategy, also known as selective or subjective sampling, is based on the researcher's discretion in deciding who to invite to participate. Researchers may thus choose an implicitly representative sample to meet their objectives or approach individuals with specific traits. This strategy is frequently employed by the media when polling the public for opinions and in qualitative research (Ben-Shlomo et al., 2013).

Instrument

This study used the following research instruments: (1) developed DepEd-TESDA competency-based learning materials (CBLM) in Computer Systems Servicing, (2) Validating Tool of the DepEd-TESDA competency-based learning materials (CBLM), and (3) Assessment Tool (pretest and post-test).

The first instrument was the researcher-developed DepEd-TESDA Competency-Based Learning Materials (CBLM) in Computer Systems Servicing. These were the primary instruments used for the quasi-experimental study. These were carefully designed to enhance the students' performance in computer servicing, validated by four experts from the TVL-Department: one TVL coordinator with Trainers Methodology, one TVL-Teacher handling AFA specialization, with Trainers Methodology and teaching for twenty (20) years, one ICT-coordinator for Junior High School, with Trainers Methodology also handling Computer subjects for five years, and one ICT-coordinator for Senior High School, with Trainers Methodology and also handling Computer subjects for five years.

The teacher-researcher created supplementary materials for a diverse range of learners. Five steps were involved in its creation: development, evaluation, validation, pilot testing, and utilization. It was composed of the following parts: (1) Title Page, (2) How to Use this Competency-Based Learning Material (CBLM), (3) List of Competencies, (4) Table of Contents, (5) Module Content, (6) Learning Experiences, (7) Introduction, (8) Objectives, (9) What I Need to Know, which includes objectives base on the curriculum guide from the Department of Education (DepEd) and training regulations of Technical Education and Skills Development Authority (TESDA), (10) What I Know, which includes pretest, (11) What's New, which includes learning activity, (12) What is It, which includes the Information Sheet, (13) What I Can Do, which includes the task sheet and performance criteria checklist or rubrics, (14) Assessment, which, includes the self-check and answer key or key to correction, (15) Definition of Terms, which includes important terms in the modules, and (16) References. This supplementary material was provided to the experts for evaluation and validation, to improve and revise it after the researcher had completed it.

The second instrument was the Validating Tool, which was adapted from the study of Espiritu (2022), which covers two levels of assessment: component and characteristics. The component level covers the following: objective, content, activity, assessment. Meanwhile, the characteristics level covers the following: relevance, appropriateness, aesthetic value, and adaptability. A Likert Scale ranging from 1 to 5 (1 = strongly disagree, 2 = somewhat disagree, 3 = neutral, 4 = somewhat agree, and 5 = strongly agree) was used to validate the DepEd-TESDA Competency-Based Learning Material (CBLM). The Likert Scale is a psychometric scale commonly involved in research that employs questionnaires. It is the most widely used approach in scaling responses in survey research. The scale is named after its inventor, psychologist Rensis Likert-Wuensch (Karl L., 2005). This tool was revised based on the recommendations of the validators. According to the validators, it would be better to put space for comments and suggestions after each indicator. The profile of the validators should be included.

Procedure

Before the experimentation, the teacher-researcher provided a request letter in written form to both the school principal and superintendent of the Schools Division of Laguna to administer a pretest and post-test among the Grade 12 ICT students in Gov.

Felicisimo T. San Luis National Agro-Industrial Integrated High School, District of Siniloan. The assessment tool covered topics from the developed DepEd-TESDA Competency-Based Learning Material in Computer Systems Servicing. Upon the approval of the research work by both parties, the researcher formally conducted the experimentation phase of the study. The developed DepEd-TESDA Competency-Based Learning Materials were evaluated through external and internal validation. It underwent content-validation and evaluation, where four experts in the field examined the said supplementary materials: two ICT coordinators, also CSS teachers with five years in service of teaching and with trainers' methodology; one TVL coordinator, and one teacher handling AFA-specialization with Trainers Methodology, with teaching experience of twenty years. After the validation and evaluation of the experts, the supplementary material underwent pilot testing and was distributed to selected twenty (20) Grade 11 ICT students. The utilization of the developed and evaluated learning material was followed. Pretests and post-tests were administered to the student-respondents to assess their performance in the subject of Computer Systems Servicing.

The results of the pilot testing and the validation of the experts were forwarded to the internal statistician to measure their reliability and consistency. Based on the calculated results of the statistician, it was found that the pretest and post-test KR-20 (Kuder-Richardson Formula) scores were above 0.70, showing that the test items are consistent and reliable. This means that the test gave a consistent result when repeated and measures students' knowledge since it provided reliable results. The internal statistician used Cronbach's alpha to measure the reliability of the supplemental material. Based on the results at the component level, objectives have a score of 0.88 (good), content has a score of 0.87 (good), activity has a score of 0.93 (excellent), and assessment has a score of 0.97 (excellent). Based on the results at the characteristics level, relevance has a score of 0.95 (excellent), appropriateness has a score of 0.93 (excellent), aesthetic value has a score of 0.73 (acceptable), and adaptability has a score of 0.97 (excellent). Overall, the results showed that the supplemental material was reliable and ready for the use of respondents.

For the students to be recognized as participants, a consent form for respondents was shown. The pretest was given to all grade 12 TVL-ICT students via Office 365 forms. The questions were multiple-choice. Since they were encoded using the forms, the application automatically assigned the correct answers. The link to the forms was sent via Messenger. Respondents used their cellphones. After answering the form, the students could automatically know their scores. After the pretest, the thirty-six (36) students utilized the developed DepEd-TESDA Competency-Based Learning Material. Participants were considered the Experimental Group. The pretest and post-test mean scores were also encoded, tallied, and interpreted. Formative tests were administered to assess the current learning progress of the students while they were using those materials. After discussing the target topics in the second quarter, the researcher administered the post-test to experimental groups via Office 365 forms to easily gather the results.

Upon the application of the treatment and conduct of the experiment, the data gathering procedures were planned out, and the data were subjected to statistical analysis.

Data Analysis

The scores obtained from the pretest and post-test were analyzed using descriptive statistics such as weighted mean and standard deviation. The weighted mean showed the average scores obtained, while the standard deviation determined how dispersed the scores were in relation to the mean, indicating the average amount of variability in the data set. The researcher also utilized the performance indicator of the score interval to assess the assessment results of the respondents, comparing their pretest and post-test scores with the equivalent descriptive data. This scale was adapted from the study of Wacas (2020).

Ethical Consideration

For the students to be recognized as participants, a consent form for respondents was shown. The pretest was given to all grade 12 TVL-ICT students via office 365 forms. The link to the forms was sent via Messenger. Respondents use their cellphones. After completing the form, students can automatically view their scores. After the pretest, the thirty-six (36 students will utilize the developed DepEd-TESDA Competency-Based Learning Material.

Results and Discussion

The study's findings are presented in this section. Results are based on the problem given. Descriptive results, test of difference, effect size, perceived level of effectiveness, and correlation analysis results are presented below.

Table 1 presents the pretest and Post-test score interval of the Grade 12 TVL-ICT students.

Descriptive Results

Table 1. *Pretest and Post-test Scores of the Students*

Score Interval	Pretest		Post-test		Verbal Interpretation
	f	*%*	*f*	*%*	
41-50	1	2.78	10	27.78	Advance
31-40	1	2.78	10	27.78	Proficient
21-30	11	30.55	13	36.11	Approaching Proficient

11-20	23	63.89	3	8.33	Developing
0-10	0	0	0	0	Beginning
TOTAL	36	100.0	36	100.0	

Legend; 41-50 = Advance; 31 - 40 = Proficient; 21-30 = Approaching Proficient; 11 - 20 = Developing; 0 - 10 = Beginning

Table 1 presents the performance levels based on the pretest and post-test scores of the respondents in Installing Network cables. As illustrated in Table 1, 23 respondents scored between 11 and 20 in the pretest, while 3 respondents scored between 11 and 20 in the post-test, which is labeled as developing performance. Eleven respondents scored between 21 and 30 in the pretest, while 13 respondents scored between 21 and 30 in the post-test, which is considered approaching proficient. One respondent scored between 41-50 in the pretest, while 10 respondents scored 50 or higher in the post-test, which is considered advanced.

Table 2. *Pretest and Post-test Scores of the Students*

Pretest		Post-test		Verbal Interpretation
Mean	SD	Mean	SD	
20.64	7.33	33.83	9.44	Approaching Proficiency-Proficient

Legend; 41-50 = Advance; 31 - 40 = Proficient; 21-30 = Approaching Proficient; 11 - 20 = Developing; 0 - 10 = Beginning

Table 2 illustrates the mean scores and standard deviation of the respondents. The mean of the pretest is 20.64, and the post-test mean score is 33.83. Therefore, post-test scores have a higher mean compared to the pretest scores. This also showed that the Grade 12 TVL-ICT CSS students' academic performance had improved after using the DEPED-TESDA Competency-Based Learning Material with 50 items of multiple-choice questions as supplementary material to enhance the performance in installing the Network cable.

Generally, the tables show that the pretest mean score of the 36 respondents is 20.64, which is approaching proficiency in performance, while the post-test mean score of the 36 respondents is 33.83, which is proficient in performance.

Additionally, the standard deviation of the pretest is 7.33, while the post-test is 9.44. This shows that the post-test has a higher standard deviation compared to the pretest results. It suggests that students' scores in the post-test are widely spread from the mean because of the intervention.

Furthermore, this aligns with the studies of Cinque (2016) and Bliven and Jungbauer (2021), which show that Competency-Based Learning Materials focus on specific skills and competencies, leading to enhanced student performance and improved overall learning outcomes. Developed Competency-Based Learning Material enhances students from low mastery to moving towards mastery. Based on the researcher's observation, students learn a lot if they do the task many times, which corresponds to the idea that more simulations mean more chances of retention.

Additionally, it was stated in the study of Mulenga and Kabombwe (2019) that Competency-Based Learning Materials capture specific skills and knowledge that students need to succeed in a particular subject or field. Developed Competency-Based Learning Material focuses on the skills related to the needs of the industry.

Table 3 presents the effect size of the DepEd-TESDA Competency-based learning materials and Test difference between the pretest and post-test scores of the Grade 12 TVL-ICT students.

Test of Difference and Effect Size Results

Table 3. *Test of Difference and Effect Size*

	Pretest		Post-test		t	df	Sig. (2-tailed)	Effect Size (Cohen's d)
	Mean	SD	Mean	SD				
Performance	20.64	7.33	33.83	9.44	8.686	35.0	.000	1.45

*df=35; **Significant at p-value <.01: Cohen's d: 0.80 and above-large effect; 0.21 to 0.79- moderate effect; 0.20 and below- small effect*

Table 3 shows the test difference and effect size of the intervention. The t-value is 8.686, and the degree of freedom value of 35.0. Based on the results presented in the table, the hypotheses are rejected and prove that there is a significant difference between the pretest and post-test results. Results also revealed that the developed learning materials enhance the academic performance of the students in installing the Network Cables.

Table 3 also shows the results of Cohen's d, which is 1.45. The results prove that the intervention is effective and has a large effect after the intervention.

According to Khallab et al. (2022), 0.80 and above have a large effect, 0.21 to 0.79 have a moderate effect, and 0.20 and below has a negligible impact. Furthermore, Henrich (2016) stated that competency-based learning materials provide a structured and organized approach to mastering the necessary skills and knowledge in computer systems servicing. These materials are designed to align with industry standards and best practices.

According to Zawawi et al. (2023), competency-based learning materials emphasize real-world application and problem-solving, thus providing learners with hands-on experience in computer systems servicing.

Meanwhile, according to Casey (2018), students who engage with competency-based learning materials demonstrate higher levels of

understanding and mastery of the material compared to traditional, one-size-fits-all approaches.

Moreover, Fitzgerald et al. (2016) note that Competency-Based Learning Materials are evident; however, addressing challenges such as the development and customization of materials is necessary for them to be aligned with curriculum standards and educational settings. Acknowledging and addressing these challenges, Sturgis & Casey (2018) stated that educators can leverage the full potential of competency-based learning materials to improve student performance and overall learning outcomes. Challenges like the customization and initial development of materials to meet the specific learning objectives, updates, and revisions due to the changing curriculum standards (Sindayen & Leon, 2023).

According to Camacho & Legare (2016), competency-based learning materials have the potential to revolutionize the way students engage with and master academic content. Their personalized and adaptive nature allows for a more tailored learning experience, catering to the individual needs and pace of each student.

Perceived Level of Effectiveness Analysis

Table 4. *Respondents' Perceived Level of Effectiveness of the Competency-Based learning Materials in term of Component Level as to Objectives*

Indicators	Mean	SD	VI
The objectives …			
1. are clear and comprehensive	4.64	0.639	Highly Effective
2. can be achieved on the given time frame.	4.50	0.609	Highly Effective
3. meet the needs of the students under ICT-CSS.	4.67	0.478	Highly Effective
4. groom the skills of students in Computer Systems Servicing	4.64	0.593	Highly Effective
5. are realistic in the modular distance learning situation.	4.58	0.554	Highly Effective
Overall	4.61	0.308	Highly Effective

Legend: 1.0-1.49 (Highly Ineffective); 1.50-2.49 (Somewhat Ineffective); 2.50-3.49 (Moderately Effective); 3.50-4.49 (Effective); 4.50-5.0 (Highly Effective)

Table 4 illustrates the respondents' perceived level of effectiveness of the Competency-Based learning materials in terms of component level as to its objectives, also it indicates respondents' mean scores and standard deviation. The overall mean score at the component level, as well as at the objective level, is 4.61, indicating that the objectives from the Competency-Based Materials are highly effective. Additionally, the standard deviation under the component level of the objective is 0.308, which indicates that most respondents have similar perceptions. The values are very low, indicating that most respondents' answers were consistent. They had the same level of agreement in their perceptions of the effectiveness of the competency-based learning materials in terms of objectives.

The learning materials' perceived level of effectiveness in terms of objectives is highly effective because it is clear and comprehensive, can be achieved within the given time frame, meets the needs of the students under ICT-CSS, grooms the skills of students in Computer Systems Servicing, and is realistic in the modular distance learning situation. Since the learning modules are based on core competencies, students are interested and have a sense of what it could mean, as the objectives are clear and comprehensive. Learning modules can also be used in modular distance learning because they are easy to understand; even at home, students can do the task given with the least supervision.

According to Torrefranca (2017), learning objectives should be precise and clear competencies that the students should acquire after the lesson. In this stage, the researcher sets clear objectives that are relevant to the topic. Objectives also serve as a guide to select appropriate content, learning activities, and assessment, and also serve as the backbone of the module; the modules cannot stand or cannot be made without them.

Table 5. *Respondents' Perceived Level of Effectiveness of the Competency-Based learning Materials in terms of Component level as to Content*

Indicators	Mean	SD	VI
The content …			
1. is clearly well-written clearly	4.64	0.593	Highly Effective
2. is categorized evenly according to the topics and time frame.	4.72	0.566	Highly Effective
3. is filled with relevant information in relevance to the objective.	4.78	0.485	Highly Effective
4. is accurate and focuses awareness of the ideas and structure of the topic.	4.72	0.513	Highly Effective
5. uses adequate vocabulary and appropriate language forms.	4.61	0.549	Highly Effective
Overall	4.69	0.381	Highly Effective

Legend: 1.0-1.49 (Highly Ineffective); 1.50-2.49 (Somewhat Ineffective); 2.50-3.49 (Moderately Effective); 3.50-4.49 (Effective); 4.50-5.0 (Highly Effective)

Table 5 presents the respondents' perceived level of effectiveness of the Competency-Based learning materials at the component level, including content, as well as their mean scores and standard deviations. The overall mean score at the component level, as to the content level, is 4.69, which indicates that the objectives from the Competency-Based Materials are highly effective. Additionally, the standard deviation under the component level as to the content is 0.381, which indicates that most respondents have similar perceptions. The values are very low, indicating that most respondents' answers were consistent. They had the same level of agreement in their perceptions of the effectiveness of the competency-based learning materials in terms of content.

The learning materials' perceived level of effectiveness in terms of content is highly effective because it is well-written, it is categorized evenly according to the topics and time frame, it is filled with relevant information in relevance to the objective, it is accurate and focuses awareness of the ideas and structure of the topic and it uses adequate vocabulary and appropriate language forms.

According to Vergara (2017), the learning materials content is composed of discussions that are relevant to the objectives. In this stage, the researcher reviews the objectives, and from those objectives, the content is formed. Content should be based on the students' level of understanding. The proper sequence of the content should be followed to ensure its consistency and effectiveness.

Table 6. *Respondents' Perceived Level of Effectiveness of the Competency-Based learning Materials in terms of Component level as to Activity*

Indicators	Mean	SD	VI
The activity…			
1. has comprehensive procedure.	4.61	0.599	Highly Effective
2. can be done on the given time frame.	4.78	0.485	Highly Effective
3. meets the required skill to develop.	4.61	0.494	Highly Effective
4. demonstrates a life-long learning.	4.83	0.378	Highly Effective
5. progresses in time, to easy, moderate, and difficult	4.83	0.561	Highly Effective
Overall	4.73	0.314	Highly Effective

Legend: 1.0-1.49 (Highly Ineffective); 1.50-2.49 (Somewhat Ineffective); 2.50-3.49 (Moderately Effective); 3.50-4.49 (Effective); 4.50-5.0 (Highly Effective)

Table 6 shows the respondents' perceived level of effectiveness of the Competency-Based learning materials in terms of component level as to activity, it also indicates the respondents' mean scores and standard deviation. The overall mean score at the component level, as to the activity, is 4.73, which indicates that the activity from the Competency-Based Materials is highly effective. Additionally, the standard deviation at the component level of the activity is 0.314, indicating that most respondents share similar perceptions. The values are very low, indicating that most respondents' answers were consistent. They had the same level of agreement in their perceptions of the effectiveness of the competency-based learning materials in terms of activity.

The learning materials perceived level of effectiveness in terms of activity is highly effective because it has a comprehensive procedure, which means the students can easily follow the instructions with minimal supervision, it can be done on the given time frame, it meets the required skill to develop because it is base from learning competencies, there is no need for the students to do the other task that is not related to the objectives and contents, it demonstrates life-long learning and it progress in time, easy, moderate and difficult diversity of learners is considered so that no one is left behind.

According to Morante (2018), activities should be aligned with the content to make the discussion meaningful. Activities can ensure that students become active, constructive, and have a collaborative experience. Organizing the learning activities, the researcher made activities that are based on the curriculum aims. The learning activities should be engaging and can catch the interest of the students. Students will both enjoy and learn.

Table 7. *Respondents' Perceived Level of Effectiveness of the Competency-Based learning Materials as to Component level as to Assessment*

Indicators	Mean	SD	VI
The assessment has…			
1. direction that is easy to understand.	4.78	0.422	Highly Effective
2. item questions that are relevant to the topic.	4.86	0.351	Highly Effective
3. item questions that are relevant to the objectives	4.64	0.639	Highly Effective
4. performance criteria presented are easy and attainable.	4.69	0.525	Highly Effective
5. performance criteria presented are fit to the needs of the students	4.81	0.401	Highly Effective
Overall	4.76	0.214	Highly Effective

Legend: 1.0-1.49 (Highly Ineffective); 1.50-2.49 (Somewhat Ineffective); 2.50-3.49 (Moderately Effective); 3.50-4.49 (Effective); 4.50-5.0 (Highly Effective)

Table 7 presents the respondents' perceived level of effectiveness of the Competency-Based learning materials at the component level, as well as their assessment. It also indicates the respondents' mean scores and standard deviation. The overall mean score at the component level, as assessed at the assessment level, is 4.76, indicating that the assessment from the Competency-Based Materials is highly effective. Additionally, the standard deviation under the component level of the assessment is 0.214, which indicates that most respondents have similar perceptions. The values are very low, indicating that most respondents' answers were consistent. They had the same level of agreement in their perceptions of the effectiveness of the competency-based learning materials in terms of assessment.

The learning materials perceived level of effectiveness in terms of assessment is highly effective because it has direction that is easy to understand, item questions that are relevant to the topic, item questions that are relevant to the objectives, performance criteria presented are easy and attainable and its performance criteria presented are fit to the needs of the students.

According to Abdulla (2018), assessment includes reliable information to check students' progress. Assessment leads to opportunities so that students can evaluate themselves and be ready for the National certification. The researcher set an assessment that is aligned with the objectives and content standards. The results of the assessment will help the students develop proficiency.

Table 8. *Respondents' Perceived Level of Effectiveness of the Competency-Based learning Materials as to Characteristic level as to Relevance*

Indicators	Mean	SD	VI
Relevance			
1. The ICT-CSS framework from DepEd is clearly presented.	4.72	0.566	Highly Effective
2. The Learning competencies is visible and clear.	4.72	0.454	Highly Effective
3. The main goal of the supplementary material is distinct.	4.61	0.494	Highly Effective
4. The different topics are shown straightforward and no diversion.	4.61	0.549	Highly Effective
5. The lessons, activities and assessment are congruent to each other.	4.61	0.549	Highly Effective
Overall	4.66	0.260	Highly Effective

Legend: 1.0-1.49 (Highly Ineffective); 1.50-2.49 (Somewhat Ineffective); 2.50-3.49 (Moderately Effective); 3.50-4.49 (Effective); 4.50-5.0 (Highly Effective)

Table 8 illustrates the respondents' perceived level of effectiveness of the Competency-Based learning materials, specifically in terms of characteristics, including relevance, as well as respondents' mean scores and standard deviation. The overall mean score at the characteristics level, as to the relevance, is 4.66, which indicates that the relevance of the Competency-Based Materials is highly effective. Additionally, the standard deviation under the characteristics level regarding relevance is 0.260, which indicates that most respondents share similar perceptions. The values are very low, indicating that most respondents' answers were consistent. They had the same level of agreement in their perceptions of the effectiveness of the competency-based learning materials in terms of relevance.

The perceived level of effectiveness of the learning materials in terms of relevance is highly effective. The ICT-CSS framework from DepEd is clearly presented, with learning competencies that are visible and clear. The main goal of the supplementary material is distinct, and the different topics are presented straightforwardly, with no diversion. The lessons, activities, and assessments are congruent with each other.

Table 9. *Respondents' Perceived Level of Effectiveness of the Competency-Based learning Materials as to Characteristic level as to Appropriateness*

Indicators	Mean	SD	VI
The supplementary material appropriately…			
1. shows different degree of learning (cognitive, affective, performance)	4.67	0.478	Highly Effective
2. conveys the topics and ideas on CSS in a simplest way possible for modular distance learning students to understand.	4.75	0.500	Highly Effective
3. gives activity that modular distance learning students can accomplished in a given time frame.	4.75	0.439	Highly Effective
4. produces quality outputs	4.50	0.507	Highly Effective
5. provides students the basic skills in CSS.	4.69	0.467	Highly Effective
Overall	4.67	0.299	Highly Effective

Legend: 1.0-1.49 (Highly Ineffective); 1.50-2.49 (Somewhat Ineffective); 2.50-3.49 (Moderately Effective); 3.50-4.49 (Effective); 4.50-5.0 (Highly Effective)

Table 9 illustrates the respondents' perceived level of effectiveness of the Competency-Based learning materials, specifically in terms of characteristics and appropriateness, also indicating the respondents' mean scores and standard deviation. The overall mean score at the characteristic level, in terms of appropriateness, is 4.67, indicating that the appropriateness of the Competency-Based Materials is highly effective. The standard deviation under the characteristics level as to the appropriateness is 0.299, which indicates that most respondents have similar perceptions.

The perceived level of effectiveness of the learning materials in terms of appropriateness is highly effective because it shows different degrees of learning, conveys the topics and ideas on CSS in a simple way, and produces quality output.

Table 10. *Respondents' Perceived Level of Effectiveness of the Competency-Based learning Materials as to Characteristic level as to Aesthetic Value*

Indicators	Mean	SD	VI
Aesthetic Value			
1. The front cover shows the title, illustrations, and grade level students in a clear and concise manner.	4.31	0.786	Effective
2. The printed fonts can be read easily.	4.44	0.558	Effective
3. The illustrations, diagrams and pictures are coordinated within the topic.	4.75	0.439	Highly Effective
4. The spacing along the titles and lines are neat and tidy.	4.25	0.770	Effective
5. The supplementary material over-all creates a feeling of significance and aspirations to achieve the goal in ICT-CSS.	4.75	0.439	Highly Effective
Overall	4.50	0.330	Highly Effective

Legend: 1.0-1.49 (Highly Ineffective); 1.50-2.49 (Somewhat Ineffective); 2.50-3.49 (Moderately Effective); 3.50-4.49 (Effective); 4.50-5.0 (Highly Effective)

Table 10 illustrates the respondents' perceived level of effectiveness of the Competency-Based learning materials, specifically in terms of characteristics and aesthetic value, also indicating the respondents' mean scores and standard deviation. The overall mean score at the characteristic level, in terms of aesthetic value, is 4.50, indicating that the aesthetic value of the Competency-Based Materials is highly effective.

Additionally, the standard deviation under the characteristics level for aesthetic value is 0.330, indicating that most respondents share similar perceptions. The values are very low, indicating that most respondents' answers were consistent. They had the same level of agreement in their perceptions of the effectiveness of the competency-based learning materials in terms of aesthetic value.

The perceived level of effectiveness of the learning materials in terms of aesthetic value is generally highly effective; however, some indicators are effective due to their printing quality and the spacing between titles. The font size will be resized so that the students can read the information easily. The researcher will also improve the spacing to ensure it is neat. Overall, it is highly effective because the front cover features the title with illustrations, creating a sense of significance and aspiration. The illustrations, the diagrams, and pictures attached are coordinated with the topic. The attached pictures were sourced from the internet to ensure their relevance to the material. The number of options suited for the module also posed a challenge in the development of the material. Nevertheless, appropriate citation and crediting for the use of the pictures were observed. Some illustrations are easy to follow to ensure that students can easily follow and use the material with or without supervision.

Table 11. *Respondents' Perceived Level of Effectiveness of the Competency-Based learning Materials as to Characteristic level as to Adaptability*

Indicators	Mean	SD	VI
The supplementary material…			
1. can be used by diverse students.	4.75	0.439	Highly Effective
2. is child-friendly and different activities are presented to accommodate learners learning capabilities.	4.75	0.500	Highly Effective
3. promotes positive interaction among peers, family, and teachers.	4.78	0.422	Highly Effective
4. individual differences and talents.	4.44	0.558	Effective
5. engages learners to broaden their thoughts for CSS.	4.81	0.401	Highly Effective
Overall	4.70	0.264	Highly Effective

Legend: 1.0-1.49 (Highly Ineffective); 1.50-2.49 (Somewhat Ineffective); 2.50-3.49 (Moderately Effective); 3.50-4.49 (Effective); 4.50-5.0 (Highly Effective)

Table 11 illustrates the respondents' perceived level of effectiveness of the Competency-Based learning materials, including characteristics such as adaptability, as well as respondents' mean scores and standard deviations. The overall mean score at the characteristics level, as to the adaptability, is 4.70, which indicates that the adaptability of the Competency-Based Materials is highly effective.

Additionally, the standard deviation under the characteristics level of the adaptability is 0.264, which indicates that most respondents have similar perceptions. The values are very low, indicating that most respondents' answers were consistent. They had the same level of agreement in their perceptions of the effectiveness of the competency-based learning materials in terms of adaptability.

The perceived level of effectiveness of the learning materials in terms of adaptability in general is highly effective, but there is one effective indicator, and that is to consider the individual differences and talents. Students have different types of learning and talents; hence, the researcher will add strategies to accommodate the different talents of the students.

According to Mede and Yalcin (2019), material adaptation refers to the alignment with the instructional objectives that are being mentioned and identified in the learning context. Adaptability is a requirement for simplifying the knowledge process by identifying knowledge problems so that learners can adopt the content effectively.

Correlation Analysis

Table 12. *Test of Correlation between the Perceived Level of Effectiveness of the Respondents' Performance and their Post-test Scores*

Component Level	Respondents' Post-Test Scores
● Objectives	0.331*
● Content	0.407*
● Activity	0.207
● Assessment	0.386*
Characteristics Level	
● Relevance	0.125
● Appropriateness	0.183
● Aesthetic	0.045
● Adaptability	0.123

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).
Verbal Interpretation of r-value: +1.0 Perfect positive +/- association +0.8 to +1.0 Very strong +/- association +0.6 to +0.8 Strong +/ association +0.4 to +0.6 Moderate +/- association +0.2 to +0.4 Weak +/- association 0.0 to +0.2 Very weak +/- or no association

Table 12 presents the correlation between the respondents' perceived level of effectiveness and their post-test scores. The Competency-Based learning materials are divided into two levels: the component level and the characteristics level. Under the component-level only objectives, which have a 0.331 R-value, content that has a 0.407 R-value, and assessment that has a 0.386 R-value have a positive

correlation, which means it is significant at the 0.05 level. It indicates that the respondents' perception of the objectives, content, and assessment has improved their academic performance.

Additionally, effective objectives, content, and assessment can lead to better performance of the respondents. The results show that there is a significant relationship among the variables. Therefore, it shows that DepEd-TESDA competency-based learning materials effectively enhance the respondents' academic performance.

The characteristics level, which encompasses relevance, appropriateness, aesthetic value, and adaptability, exhibits a weak correlation, ranging from 0.045 to 0.183. This indicates that it does not impact the academic performance of the respondents.

Sana et al. (2020) state that objectives refer to the outcomes that the students should acquire. Well-articulated objectives have cognitive, psychomotor, and affective domains of learning. Objectives are measurable and SMART so that the students can go through and achieve the goal. It is essential to understand each domain to establish a framework that can effectively evaluate student learning.

Zhou (2017) mentions that objectives are expected, observable, and measurable skills, knowledge, and behavior that learners should show. Objectives can be achieved within a given time.

According to B&C Educational (2018), selecting the correct materials is the teacher's responsibility to support the learning foundation of each student. During the development of the learning materials, the appropriateness of the objectives, contents, activities, and assessment is considered because it is the elements of the course. When a set of assessments is aligned with instructional objectives and content standards, teachers can provide students with information about the specific concepts and skills they need to learn.

According to Kampen (2020), assessment can improve the performance of students based on the feedback given. Assessment covers the learners' strengths and weaknesses in the performances given. Through feedback, learners can easily absorb specific concepts and skills that help them develop their learning goals.

According to Liu et al (2020), the competency-based learning materials will be successfully implemented if the teachers have proper training, with complete resources and proper assessment and feedback.

Santos (2020) argues that students who use competency-based learning materials have higher competencies and can secure better jobs in the future compared to those who use traditional learning methods.

Furthermore, aligning the competency-based Learning materials with the TESDA's competency standards ensures that the students can meet the industry expectations after graduation, increase their employability, and make them job-ready (Reyes & Mendoza, 2021). Despite all the benefits mentioned, there are also challenges to meet, such as resistance to change, limited resources, diversity of learners, and preparedness that can hinder the development and implementation (Alonzo & Martinez, 2020).

To improve the vocational education of senior high school students and their outcomes, it is necessary to develop competency-based learning materials in Computer Systems Servicing; however, doing so alone is not enough. Collaboration with stakeholders and adherence to industry standards, as well as effective technology integration, are also key factors in making this development successful.

The respondents of this study were the 36 Grade 12-ICT learners. The learners' performance was at an average level based on their pretest mean scores.

It was also found that the participants increased their post-test mean score; the result depicted that the supplemental material contributed to the improvement of participants' performance in installing the network cable. Post-test mean scores have a higher mean compared to the mean of the pretest scores, showing that the academic performance of the Grade 12-TVL CSS students had improved after using the supplemental material.

A significant difference was observed between the mean scores of the pretest and post-test, with a t-value of 8.686, a degree of freedom value of 35.0, and a probability value of 0.000. The supplemental material was certainly effective in enhancing the students' academic performance.

There was a large effect on the effectiveness of the supplemental material being used. Based on Cohen's d result, the p-value is 1.45. The intervention is boosting the academic performance of the students.

The respondents' perceived level of effectiveness of the Competency-Based learning materials, in terms of component level, is highly effective. Objectives have a 4.61, 0.308 standard deviation, content has a 4.69 mean, 0.381 standard deviation, activity has a 4.73 mean and 0.314 standard deviation, assessment has a 4.76 mean and 0.214 standard deviation. In terms of the characteristics level is also highly effective. Relevance has a 4.66 mean and 0.260 standard deviation, appropriateness has a 4.67 mean and 0.299 standard deviation, aesthetic value has a 4.50 mean and 0.330 standard deviation, and adaptability has a 4.70 mean and 0.264 standard deviation. Competency-based materials are highly effective.

The correlation between the perceived level of effectiveness of the students' performance and their post-test scores has a significant relationship among the variables. Objectives have 0.331 R-value, Content has 0.407 R-value, and assessment has 0.386 R-value. This indicates that the mentioned variables are at the 0.05 level, which means significant.

The data presented in Table 2 show that Competency-Based Learning Materials focus on specific skills and competencies, which can lead to enhanced student performance and improved overall learning outcomes (Bliven & Jungbauer, 2021).

Table 3 illustrates that Competency-Based Learning Materials are equipped with specific skills and knowledge that students need to succeed in a particular subject or field. The developed competency-based learning material focuses on skills related to the industry's needs (Mulenga & Kabombwe, 2019).

Moreover, Table 4 emphasizes that Competency-Based Learning Materials are evident; however, addressing challenges such as the development and customization of materials is necessary for them to be aligned with curriculum standards and educational settings (Fitzgerald et al., 2016). Tables 5, 6, 7, 8, 9, 10, and 11 illustrate that the learning materials' perceived level of effectiveness is highly effective because they are clear and comprehensive, can be achieved within the given time frame, meet the needs of students under ICT-CSS, and are realistic in the modular distance learning situation. On the other hand, Table 13 shows that objectives are expected, observable, and measurable skills, knowledge, and behavior that learners should show. Objectives can be achieved within a given time. Selecting the correct materials is the teacher's responsibility to support the learning foundation of each student (Zhou, 2022). During the development of the learning materials, the appropriateness of the objectives, contents, activities, and assessment is considered because it is the elements of the course. A set of assessments is aligned with instructional objectives and content standards, teachers can offer students information about which specific concepts and skills they need to learn (Cizek et al., 2018). Assessment can improve the performance of students based on the feedback given. Assessment assesses the learners' strengths and weaknesses in the performances given. Through feedback, the learners can easily absorb specific concepts and skills that can help them develop learning goals (Sun & Kampen, 2020). The competency-based learning materials will be successfully implemented if the teachers have proper training, with complete resources and proper assessment and feedback (Liu et al., 2020).

Conclusions

In conclusion, to improve the vocational education of senior high school students and their outcomes, it is highly necessary to develop Competency-Based Learning Materials in Computer Systems Servicing; However, doing so alone is not enough. Collaboration with stakeholders and adherence to industry standards, as well as effective technology integration, are also key factors in making this development successful.

The post-test results of the respondents have a greater mean compared to the pretest mean scores. It signifies that the academic performance of the Grade 12 TVL ICT students had improved after the implementation of the supplemental material.

The effectiveness of the supplemental material used has a large effect. The intervention is very effective and can enhance the learner's performance.

There was a significant difference between the pretest mean score and the post-test mean score of the Grade 12 TVL-ICT students. The supplemental material was certainly significant in enhancing the student's academic performance.

The respondents' perceived level of effectiveness of the Competency-Based learning materials in terms of component level and the characteristics level is highly effective. The intervention is very effective and can enhance academic performance.

A significant relationship existed among the variables. Objectives, content, and assessment have a positive correlation with the perceived level of effectiveness of the students' performance and their post-test scores.

Based on the results gathered from the study, the following are recommended:

The teachers in Gov. Felicisimo T. San Luis NAIIHS may use the DEPED-TESDA Competency-Based Learning Material (CBLM).

The teachers should be equipped with training related to his/her specialization before using the learning materials.

The teachers were recommended to adopt DepEd-TESDA Competency-Based Learning Material (CBLM) to improve students' performance in installing the network cables.

Learners should have self-discipline in performing each task and completing the task based on the performance criteria.

The school head and administration may support and provide a budget for the tools, materials, and equipment needed by the program to enhance students' learning.

Future researchers may conduct in-depth studies considering the scope and parameters of this study, as it only covered the installation of network cables and the performance criteria of Grade 12 students at a specific school.

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