

**DEVELOPMENT AND VALIDATION OF A LOCALIZED MODULE
IN SCIENCE, TECHNOLOGY, ENGINEERING AND
MATHEMATICS COMPETENCIES FOR FOOD
AND BEVERAGE SERVICES
LEVEL II TRAINEES**

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ABSTRACT

This Research and Development study developed and validated a localized Science, Technology, Engineering, and Mathematics (STEM) Competencies for Food and Beverage Services (FBS) level II trainees. Twenty-five (25) FBS NC II trainees from General Santos National School of Arts and Trades participated in the study; 72% were female, 28% were aged 21-25, and 72% were college graduates. Trainers, assessors, and industry experts evaluated the modules. Analysis of variance (ANOVA) and weighted mean were employed to answer study issues and examine evaluator ratings. The competencies of preparing the dining area, promoting food and beverage, and providing room service are the least mastered. There is a significant difference in these competencies based on sex with $t=3.017$, $p=0.012$ and age with $t=5.081$, $p=0.005$, but not on educational achievement $f=1.856$, $p=0.160$. Required knowledge, skills, and (STEM) Competencies were identified based on the training regulation of the qualification. The correlation test showed p-values greater than 0.05, supporting the null hypothesis that mean gain scores on evaluating localized modules with STEM competencies in objectives, concepts, skills, usability, appropriateness, and adequacy are not significantly different. Thus, it is recommended that the localized module be tested in the training of FBS NC II and employed in the subsequent study.

Keywords: *Localized Module with STEM Competencies, Food, and Beverage Services NC II, Research and Development, TESDA-GSNSAT*

Chapter I

THE PROBLEM AND ITS SETTING

Introduction

Delivering STEM skills is vital for economic growth and innovation, and TVET plays a crucial role in developing STEM human capital. With the rapid changes in technology, business, and health risks, STEM education equips individuals with skills that are difficult to automate and essential for innovation. STEM education fosters the development of critical skills needed for the workforce (International Labour Organization, 2021). TVET programs have STEM competencies, but they should be connected to workplace relevance. Clear definitions of STEM skills in TVET are necessary for effective pedagogies. Identifying prioritized STEM competencies and successful teaching methods aligns TVET with future workforce needs and current vocational education trends.

Technical Education and Skills Development Authority (TESDA) utilizes competency-based training (CBT) to ensure trainees acquire the specific skills and knowledge required for their chosen field or anticipated changes. CBT allows trainees to learn at their own pace while taking responsibility for their learning through accessible resources provided by trainers (Boahin, 2012).

Effective instructional materials greatly impact the teaching-learning process. Accessible and straightforward resources increase the likelihood of successful learning outcomes, while a lack of materials can hinder trainee performance (Seven & Engin, 2017). Delivering concrete tasks and visual representations enhances meaningful learning. Regardless of the resources used, trainers play a vital role in facilitating trainees' learning and achievement (Afolabi & Joshua, 2019).

In Garin's (2017) study, localized instruction improved students' probability performance compared to contextualized instruction, with those receiving both performing better on empirical tests but worse on theoretical tests. The study emphasized the importance of incorporating local examples, information, and culture in curriculum development. STEM integration in TVET shows promise, enabling students to connect across various fields and challenging the perception of TVET as a non-college-bound path. TVET's existing framework in applied sciences and mathematics supports its role in preparing future technicians, technologists, and engineers.

Integrating STEM into TVET allows students to explore contextualized ideas, fostering a deeper understanding (Tsupros, 2019). STEM knowledge is valuable even in non-STEM TVET fields, and rigorous programs can provide a strong foundation for a broader range of students, delivering STEM competencies and capabilities. The contextualized nature of STEM in TVET classes enables students to grasp concepts more efficiently compared to

academic courses. STEM integration in TVET is crucial for developing digital economy skills and promoting economic growth. The emphasis on critical thinking, problem-solving, and innovation in STEM provides a strong foundation for a workforce capable of tackling challenges and adapting to crises.

The proposed localized module in Science, Technology, Engineering, and Mathematics (STEM) competencies for Food and Beverage Services (FBS) Level II trainees aims to prepare young individuals for the workforce. It is designed to facilitate quick understanding and application of necessary skills. As the existing modules used for skills training are broad and aligned with the Association of South East Asian Nations (ASEAN) standard, some trainees struggle to comprehend and apply them in real-world scenarios. Implementing the proposed localized module may equip trainees with the skills needed for work-related fields, fostering constant learning, responsible citizenship, and readiness for the fourth industrial revolution in the food and service industry.

Putting together a literature review from numerous publications and papers, the researcher identified a need for more studies on localizing modules in TESDA, specifically Food and Beverage Services NC II. Existing modules cover a broad scope aligned with the Association of South East Asian Nations (ASEAN) toolbox and require localization. The researcher also found limited research on localizing modules integrated with Science, Technology,

Engineering, and Mathematics competencies in TESDA, highlighting the importance of this study as a foundation for future advancements in this area.

Statement of the Problem

This study aimed to develop and validate a localized module with Science, Technology, Engineering, and Mathematics Competencies for Food and Beverage Services Level II trainees in Technical Education and Skills Development Authority (TESDA) - General Santos National School of Arts and Trades (GSNSAT) for academic year 2022. It is validated with the help of selected professional experts.

Specifically, this research sought answers the following questions:

1. What is the demographic profile of the trainees in terms of:
 - 1.1. Sex;
 - 1.2. Age; and,
 - 1.3. Educational attainment?
2. What are the least mastered competencies of the Food and Beverage Services NC II trainees?
3. Is there a significant difference between the least mastered competencies of Food and Beverage Services NC II trainees in terms of:
 - 3.1. Sex;
 - 3.2. Age; and,
 - 3.3. Educational attainment?

4. Based on the findings of the study, what appropriate STEM competencies may be developed in the localized module?
5. What are the components of the Localized Module with Science, Technology, Engineering, and Mathematics competencies in Food and Beverage Services NC II in terms of:
 - 5.1. Contents; and,
 - 5.2. Skills?
6. What were the mean gain scores of the trainers, assessors, industry experts-evaluators of the Localized Modules in terms of:
 - 6.1. Objectives;
 - 6.2. Concepts;
 - 6.3. Skills;
 - 6.4. Usability;
 - 6.5. Appropriateness; and,
 - 6.6. Adequacy?
7. Is there a significant difference among the mean gain scores of the trainers, assessors and industry experts-evaluators in terms of:
 - 7.1. Objectives;
 - 7.2. Concepts;
 - 7.3. Skills;
 - 7.4. Usability;
 - 7.5. Appropriateness; and,

7.6. Adequacy of the localized modules?

Hypotheses

The following null hypotheses are tested at a *0.05* level of significance.

Ho₁: There is no significant difference between the least mastered competencies of FBS NC II trainees in terms of sex.

Ho₂: There is no significant difference between the least mastered competencies of FBS NC II trainees in terms of age.

Ho₃: There is no significant difference between the least mastered competencies of FBS NC II trainees in terms of educational attainment.

Ho₄: There is no significant difference among the mean gain scores of the trainers, assessors, and industry experts-evaluators in terms of objectives.

Ho₅: There is no significant difference among the mean gain scores of the trainers, assessors, and industry experts-evaluators in terms of concepts.

Ho₆: There is no significant difference among the mean gain scores of the trainers, assessors, and industry experts-evaluators in terms of skills.

Ho₇: There is no significant difference among the mean gain scores of the trainers, assessors, and industry experts-evaluators in terms of usability.

Ho₈: There is no significant difference among the mean gain scores of the trainers, assessors, and industry experts-evaluators in terms of appropriateness.

Ho₉: There is no significant difference among the mean gain scores of the trainers, assessors and industry experts-evaluators in terms of adequacy of the localized module.

Significance of the Study

This localized module focused on the Food and Beverage Services (FBS) NC II that is included in the training regulations and competency standards of the Technical Education and Skills Development Authority (TESDA) and in achieving the goal of producing globally competitive middle-level human resources equipped with 21st-century skills. It was composed of information sheets and learning activities integrated with Science, Technology, Engineering, and Mathematics competencies. This localized module may serve the following purposes:

Technical Education and Skills Development Authority – General Santos National School of Arts and Trades Administration. This may serve as baseline to compare the difference between utilizing the centralize

module and the localize module of FBS NC II towards the competency attainment of the trainees. It may also serve as the basis in developing modules for the other qualifications.

Trainers. It may reinforce trainers' instruction aiming to deepen trainees' understanding of the required knowledge, skills and attitude set by the industry. Also, this may serve as an instrument to identify the recurring difficulties of the trainees in performing tasks and determine problems related to food and beverage services. As a result, this may be guide for the trainers to determine the level of comprehension and mastery of trainees

Trainees. This may be used as additional study material to help with problems and learn more about food and beverage topics. For trainees to fully understand, appreciate, and master the food and beverage services idea and skills, which the current generation of trainees needs today, this module offers suitable learning activities combined with STEM Competencies based on their area.

Food and Beverage Services Instruction. This may add significant learning material for the continuous development of the trainees in their quest to be more passionate about the said skills training. Localize module may expose the trainees to the local scenario of the food and beverage industry in the city.

Researcher. The creation of this module may present an opportunity to improve the training received at General Santos National School of Arts and

Trades, mainly since it is directed toward those who most require it. Additionally, this may present the researcher with a chance to realize her full potential in developing teaching aids that are inspired by her desire to help trainees and by research principles.

Other Researchers and Future Studies. The development of this module may be the starting point for all the trainer-researchers, not just in General Santos National School of Arts and Trades but also the other TESDA administered school to develop their localized modules that will make their skills training related to their locality. This may serve as a baseline study of how it will affect the attainment of required competencies as set by the training regulation of the agency.

Scope and Limitations

The topics included in the development and the validation of the localized module in Science, Technology, Engineering, and Mathematics (STEM) Competencies for Food and Beverage Services National Certificate II were taken from the training regulation set by the industry. More so, the coverage of the topics was presented in such a way that it applies to the establishment of the City of General Santos. Descriptive data analysis was used to evaluate the module's content validity.

To have the baseline of what STEM competencies should be included in the localized module, the pre-training assessment was given to twenty (25)

FBS NC II trainees that served for profiling and assessment of competencies or performance criteria. The standardized pre-training assessment was composed of the characteristics of the trainees, self-check, and a 30-item written test. From there, the sex, age, educational attainment, and the least mastered competencies were gathered. Analysis of the pre-training assessment followed, and the module draft was prepared.

Five (5) FBS Trainers, five (5) FBS Assessors, and five (5) industry experts evaluated the module's initial draft based on its skills, objectives, usability, concepts, appropriateness, and adequacy. These three teams of evaluators were drawn from organizations recognized by TESDA Region 12. The construction of the localized module in the Food and Beverage Services NC II linked with STEM competencies for FBS trainees was based on their feedback and description of the ratings they gave for these criteria.

The localized module's information sheets and learning activities served the following purposes. First is to measure the learners' mastery of the food and beverage concepts, skills, and attitude, especially in providing FBS, and second is to deepen their understanding of the specified concepts, skills, and attitude and to develop their critical thinking, creative thinking skills, and problem-solving skills as required by the industry of tourism.

Chapter II

REVIEW OF RELATED LITERATURE

The following review of the related studies and literature helped shaped the study into powerful whole. The related studies presented here are chosen by their significance in promoting the direction of this research.

Theoretical Framework

This study is anchored on the Instructional Design Theory by Reigeluth (2012), which involves the concepts of developing pedagogical instruction and organizing learning materials. It is a set of twentieth-century theories concerned with teaching approaches. The activity of applying theories to instructional improvement procedures is exemplified by instructional models, instructional strategies. However, instructional design theory, instructional theory, instructional models, and other terms are typically referred to as instructional design by pedagogues and in daily speech.

Furthermore, according to Reigeluth (2012), instructional-design theories are plan oriented; they explain approaches of instruction and the conditions under which those methods should be utilized, the methods may be broken down into more straightforward component approaches, and the approaches are probabilistic. According to Merrill (2013), instructional theory

focuses on two significant issues: what to impart and how to educate. This idea is highly related to several didactic definitions. Didactics is focused on the same difficulties, as well as why anything should be taught at all.

In contrast, Driscoll (2013) highlighted constructivist theory as a teaching and learning technique based on the notion that cognition (learning) is the outcome of "mental construction," in which students learn by combining new information with what they already know. Constructivists think that the context of a notion, as well as the beliefs and attitudes of students, influence learning. Constructivism is a learning paradigm in psychology that describes how humans gain knowledge and learn, according to Tam (2014). Therefore, it has a direct bearing on schooling. According to the study, humans create knowledge and significance through their experiences.

Piaget's (1976) constructivist learning theory has affected extensive array of learning theories and teaching methods in education, and it is a prominent factor in many reform activities. Constructivist instruction practices have established mixed technical support, with some research confirming their findings and others contradicting them. When prior experiences and context are applied to understanding a new concept or completing a new task, learners learn effectively; the content to be learned is structured optimally, such as from simplest to most complex; and learners engage in hands-on explorations/inquiries that facilitate concept discovery and knowledge construction, learners learn effectively.

Localized Module

Localized learning materials stand out because they may blend the learners' culture and local knowledge into meaningful learning. UNESCO has requested that its members create curricula relevant to students and based on local requirements. The Philippines should strengthen its curriculum by adopting a curriculum that represents the country's unique cultural past, according to the Regional Seminar's final report in 2002. Several academics have been effective in demonstrating the potential influence of using localizing resources in the teaching-learning process throughout the previous decade.

During the second quarter of the 2018-2019, Dioneda (2019) conducted a study to examine the impact of localization and contextualization in biology teaching on the academic performance of chosen seventh-grade students at Paliparan National High School. The research employed an experimental design, namely a pre- and post-test control group design. The t-value calculated for this t-test was -16.404 , and the p-value was 0.000 . The independent samples of posttest performance of both sections, Grade 7 Considerate and Generous, revealed that the calculated t-value was -16.404 and the p-value for this t-test was 0.000 in assumed equal variances. Both post-tests were significantly different since the p-value was smaller than the alpha value of 0.05. The post-test average mean score for Grade 7 Generous was obviously 15.15 higher. The post-test average mean score for Grade 7

Generous was 15.15 higher than for Grade 7 Considerate. The confidence interval had a lower level of -16.98862 and a higher level of -13.31138, and it did not cross zero, indicating a difference.

The findings revealed that the post-test grades of the two clusters were considerably different. Teachers in all subject matter should strive to incorporate localization and contextualization into their courses since it favors student performance and motivation. The study of Ballesteros (2014) found an improvement in students' Science performance after exposure to localized and contextualized science activities, as described in the findings with a "proficient" level of performance.

Dangle (2020) conducted a study to determine instructors, parents, parents, and students' trials, views, and commendations in applying Modular Distance Education at Balbalayang National High School and Baguio City National High School. Using modules, according to the study's conclusions, increases independent study.

The ability of learners to learn more independently is one benefit of using modules for instruction. The learners enthusiastically accept the principles taught in the module. They develop a shared feeling of accountability as they finish the module's tasks while trying to achieve students' growth with little to no assistance from others. They are becoming better balanced and learning to absorb (Nardo, 2017). Additional advantages of modular teaching include increased learner choice and self-pacing,

improved flexibility of educational resources, and increased diversity and flexibility for teachers and staff.

Garin (2017) conducted a study wherein they saw how teaching localized data affected students' performance in Probability. On the empirical test, the pretest and post-test performance of learners exposed to contextualized and localized instruction is higher than that of learners exposed to contextualized instruction without localization. However, they could perform better on the theoretical type of test. According to the researchers, students' performance improved dramatically due to real-world, community-based training. Students who employ localized materials in statistics do better than those who use the standard module, according to his research findings. As a result, he advises teachers to use local samples, knowledge, and culture while creating curricular guidelines.

Science, Technology, Engineering and Mathematics (STEM) Competencies in Technical Vocational Education and Training (TVET)

STEM education in TVET is crucial for acquiring digital economy skills. The spread of STEM skills has been advocated for improving economic growth and resilience in severe crises. Because critical thinking, problem-solving, and innovation skills have become ingrained, a workforce rich in STEM skills creates a solid foundation that can withstand economic challenges. The concept of STEM has influenced many education and workforce strategies and policies to promote invention, efficiency, and worldwide keenness. The focus

has been on how the school and university sectors might assist in preparing the workforce with the STEM-related skills and knowledge necessary for the industry's evolution (Siekmann & Korbel, 2016).

TVET is particularly relevant to occupations in the technical workforce sector that require intermediate-level knowledge and skills in a variety of ways: traditional trades and technicians have a link to a specific TVET qualification or apprenticeship, whereas many non-trade-related fields of study, such as information technology and accounting, develop more generic skills that can be applied to a variety of occupations (Knight & Mlotkowski, 2012).

STEM competencies that are maintained are STEM knowledge, cognitive skills, multiliteracies, and socio-emotional intelligence are the four primary domains of Technical and Vocational Education and Training (TVET). The STEM-oriented curricular plan follows the previous TESDA model except for an additional column for STEM competencies. It is done to demonstrate STEM skills that are already included in TVET certifications. STEM-focused learning activities, strategies, and evaluation methods are also presented. Although there are several suggested activities, they are in no way prescriptive. Finally, curriculum planners and trainers must determine which exercises are most relevant to their qualifications and can be performed within the time frame specified (ILO & UNESCO, 2018).

The International Labor Organization (ILO) Women in STEM for Workforce Readiness and Development Program reiterates the same

conclusion, consistent with the Fourth Industrial Revolution (4IR) Framework developed by the TESDA. The STEM in TVET Learning Design Framework has already been developed. The framework combines significant global ideas and practices on STEM in TVET to produce one tailored to the Philippine context. It provides critical STEM abilities as well as instructional methodologies ideal for TVET. It also addresses the significance of teacher professional development, creativity and intelligence, resources, the ecosystem, the education continuum, and cultural context in guaranteeing STEM success in TVET. Developing this STEM in TVET Curriculum Guide is the logical next step for a learning design framework: a curriculum guide that turns the framework into practical material for curriculum authors, writers, trainers, and evaluators (Matarazzo, Durik, & Delaney, 2012).

The curriculum guide's key components include mappings of STEM competencies in current TESDA competencies, reference papers, templates for STEM-oriented activities, and assessment procedures. The primary, standard, and core competency maps for STEM demonstrate that STEM is present in the curriculum, and additional competencies must be cultivated. On the other hand, reference materials detail the pertinent information and specific indications of each STEM skill and instructional exercises for applying the competency (ILO, 2021).

The goals of STEM in TVET are identical to the goals of 21st-century skills: employability, proactive citizenship, and human flourishing. STEM

competencies encompass not just skills but also knowledge and multiliteracies. Being prepared with the knowledge, abilities, and attitudes necessary for employment is the goal of employability. On the other hand, proactive citizenship means acting as a responsible global and digital citizen and contributing to nation-building. No framework specifically mentions the third aim, "human flourishing," comparable to lifelong learning but on a far higher level. Human flourishing represents the ultimate level of self-actualization. It signifies that a person can grow and succeed regardless of the situation, for themselves and others (Korbel, 2016).

While it is generally accepted that TVET, by its very nature offers the perfect way for the incorporation of STEM, one could also argue that integrative STEM, with its focus on innovation and problem-solving, is an acceptable vehicle for supporting TVET. Whatever point of view is chosen, the relationship between TVET and STEM is established. There is no better way to advance than to include and enhance STEM in the educational system and enhance it.

The Training Regulation of Food and Beverage Services NC II, which includes the Basic, Common, and Core competency, is integrated with STEM-related knowledge and skills. To go into more detail on the STEM-related knowledge and abilities in the Training Regulation, including information analysis and interpretation, qualitative, quantitative, and statistical research methods, report writing, and the usage of pertinent software. The science

behind preventing injuries and guaranteeing workplace safety must be understood and applied to practice occupational health and safety.

On the other hand, the scientific approach is related to fixing problems that arise during job activities. Doing so necessitates identifying the causes of the issue, taking the necessary corrective or preventive action, and formulating a suggestion to the manager. Mathematical concepts and processes necessitate the discovery and use of mathematical concepts, tools, and techniques to resolve issues at work. Utilizing pertinent technology refers to choosing and implementing appropriate technologies in the workplace in compliance with accepted industry standards. Information gathering, analysis, and organizing are all components of the broad scientific problem-solving investigation. This competency unit calls for expertise in data processing, information analysis and interpretation, qualitative, quantitative, and statistical research methods, report writing, and pertinent software.

The NC IV criteria for advanced STEM abilities include descriptions of research and analysis. Learning and innovation are also included as 21st Century Skills Framework competencies that have been embraced and included in the expanded Basic Competencies in the TVET Training Regulations (TRs). Additionally, the competency units for each NC level have been established. TESDA should also consider how it might provide opportunities for professional development, coaching, and mentorship to trainers so they can teach STEM skills in TVET programs.

Development of Localized Learning Module

Free exploration is made more accessible by module development. It teaches students how to memorize or practice info. In order to establish the legitimacy of the ideas, exercises that move from easy to tough are followed by practices. Thus, the activities' order certifies the comprehension depth that the students can handle. Improving understudies' reports or learning capacities is another benefit of adopting instruction modules. Students are focused on comprehending the ideas taught in the module. As they finish the module's assignments, they understand what people expect. Without much or any help from the teacher, the students advance. They are engaged in the learning process as they work to understand it (Nardo & Hufana, 2014).

The three standards help to support the use of module localization. It has been established that advice with localized substance can launch trainees' earlier learning and promote progressively successful critical thinking for the principal guideline, earlier knowledge. A film on the precipitation of a supersaturated arrangement was one model that increased trainee learning in a concept test on arrangements and solvency from a 33% rise without a video to an 81% increase when a video was included. For the third rule, Localization of substance helps understudies figure out how to connect concepts from a natural solid environment of a unique notion to recognize their relationship to these ideas for enhancing metacognition (Dimacali, 2018).

The importance and areas of interest of modular training were recorded by Field (2015). Modular education alleviates the stress of competition and the risk of disappointment. As a result, engagement is increased: understudies and instructors are responsible for learning. Modules have their work-in-progress evaluation. They provide prompt and thorough feedback to the understudy. Trainees can choose from a variety of learning materials thanks to modules. The trainees' shortfall has been compensated for by a deficiency module that instills additional incentives. Modules are organized so that the understudy may quickly comprehend the point or exercise's objectives and, as a result, proceed legitimately and make efforts to achieve them.

Modules are effective for boosting the quality of advice if built in a dependable method and all of the module's pieces work together. It is usually approved in the following ways. It must begin with the module's points. This depicts what the module must do, the extensive content used to purchase it, and any motivation or desires it will fulfill for the trainees (Ganiron, 2015).

The creation of modules also facilitates unlimited exploration. It teaches students how to practice or exercise data. In order to verify the validity of the concepts, practices are provided after the progression of simple to challenging activities. Thus, the order of the exercises verifies the level of comprehension that the trainees can manage. A further advantage of employing modules for training is the improvement of students' grades or learning ability. Students are intent on comprehending the module's provided contents. In completing the

module's assignments, they understand others' expectations. The students advance with minimal or no support from the instructor. They are interested in learning how to learn (Nardo & Hufana, 2014).

Perin's (2013) research focused on the importance of Localizing Modules in improving thinking skills and acquiring fundamental topic knowledge at the elementary school level. She identified two renderings with demonstrated appropriateness in examining the writing on localization. The most well-known is upgrading formative courses to encourage using materials derived from a term related or branch of knowledge that is essential to the learner. The assimilation of the contents into the texture of different courses is the least-known methodology, but it is the methodology most relevant to this project.

The developed localized module will contain and validate through its objects, concepts and contents, skills, usability, appropriateness, and adequacy.

Objectives. Adam (2014) asserts that learning outcomes and objectives resemble navigational devices such as Global Positioning System. Once the driver inputs his or her destination into the GPS, the gadget will guide him or her during the journey, ensuring that he or she arrives at the target location without getting lost. Even if the driver picks the wrong path, the GPS will assist him in regaining the correct way to the destination. In contrast, learning objectives are guiding tools that direct students toward the desired

course outcomes. In addition to showcasing and supporting professors with course mapping, they inform students of what they can do after course completion. Likewise, they aid instructors and students in comprehending the correct path of action.

Learning objectives give students a clear grasp of what is expected of them. Students can identify and organize the course's essential concepts and objectives by defining explicit learning expectations. A learning objective must be a specific, measurable, short-term, recognizable statement that specifies desired knowledge, skills, or attitudes expected of learners as a result of instructional events, summarizes course standards and opportunities, is related to course objectives, which are broader statements reflecting course goals, and provides a framework for assessing student understanding and development (Fink, 2013).

Bloom's Taxonomy can also accomplish learning objectives utilizing the cognitive, affective, and psychomotor learning domains (Bloom's Taxonomy, 2012). Creating new knowledge (cognitive), growing sentiments and emotions (affective), and enhancing physical and manual skills are the three types of learning (Psychomotor). An educational psychologist, Dr. Benjamin Bloom, developed Bloom's Taxonomy in 1956 to foster higher-order thinking in classrooms, such as assessing and evaluating concepts, processes, methods, and principles instead of simply memorizing (rote learning). It is most commonly used to develop instructional, training, and learning approaches.

The learning module contains subject summaries, instructions, and information on pupils' learning (Hamdunah, Yunita, Zulkardi, & Muhafzan, 2016). It is an instructional material intended to simplify, stimulate, improve, and promote teaching and learning activities to enhance and support effective instructional processes (Matarazzo et al., 2012). The learning module introduces students to new learning strategies and opportunities, expanding their knowledge and supporting them in overcoming inadequacies (Egcas, Tabotabo, & Geroso, 2017). In order to address students' weakest skills, teachers need to be aware of the prerequisite topics. Students can improve their mathematical abilities, talents, and motivation to learn by using learning modules (Saifiyah & Setiyani, 2017).

Concepts and Contents. Teachers should be aware of deep and superficial learning principles when developing modules. Much research has already been done on the relationship between courses and how students learn. To learn topic concepts, it is vital to plan ahead of time. The subjects, ideas, beliefs, performances, concepts, and evidence meant to be learned and form the foundation of education and learning are often classified as learning content. Learning content is frequently classified as knowledge, skills, values, and attitudes within each subject or learning range. The more deeply a pupil absorbs material, the more probable it is that he or she will remember it. This level of thinking also helps the student generate more meaningful knowledge, which promotes memory (UNESCO-IBE, 2013).

Halpern and Hakel (2013) assert that when establishing the contents of a module, both Gagné's nine instructional events and Bloom's Revised Taxonomy should be considered. The nine instructional events outlined by Gagné can help establish a framework for arranging and presenting instructional information while also considering and controlling learning environments. Create course goals and learning objectives before applying the nine events; the goals and objectives will help place the events in their correct perspective. The nine learning experiences can then be adjusted to the topic matter and the student's comprehension level.

According to Bulusan (2019), learning content becomes authentic when it establishes a strong relevance and a solid link to the learners' motivations, needs, and histories. Ozele (2012) suggested in his study on contextualizing Nigerian stories, proverbs, and idioms that students cherish their cultural heritage when instructional resources and instructional designs are based on their own culture and standards. According to Spring (2014), in his study on contextualization, when teachers customize their lectures to the learners' culture and setting, students' learning improves. In an essay titled "Contextualized teaching and learning as a critical approach," the career ladder project stated that students learn better and faster when the instructional design incorporates the learners' local knowledge.

Skills. Ouelette, Clochard-Basuet, Young, and Westerman (2020) developed a learning framework for STEM in TVET that incorporates the

Human Skills Matrix (HSX) developed by the MIT Jameel Abdul Lateef World Education Lab (MIT J-WEL) Workforce Learning Collaborative, which identifies 24 durable skills and attributes required for individuals to thrive in the work of the future, which is heavily influenced by automation. Thinking, interacting, regulating ourselves, and leading are the four categories in which the skills are structured. Critical thinking, creativity, entrepreneurship, ethics, systems thinking, comfort with uncertainty, and a growth mindset are all examples of thinking skills. Conversely, interaction skills include communication, collaboration, empathy, bargaining, and relationship curating. Skills dealing with the management of selves entail self-awareness, responsibility, flexibility, development and organization, perseverance, efficiency, creativity, and reliability.

Although there are some commonalities with previous frameworks on 21st-century competencies, the Human Abilities Matrix has two distinguishing elements, particularly its emphasis on leadership skills and the importance of multiliteracies in future employment. The first element implies that all workers, regardless of their position, whether at entry level or a much higher level, must have foresight for what their work requires and know how to manage the people with whom they work to achieve desired results. A type of literacy links two categories of abilities in the framework. Organizational literacy, for example, connects interacting and leading capabilities, suggesting that when these two skill sets are combined, it results in the capacity to traverse an

organization effectively by knowing how people can be connected and empowered toward accomplishing shared workplace goals (Morgan, 2021).

Usability. The user's involvement with a learning module is called usability; how the contents are organized assists the user's learning. It is the property of a module that makes it easy to learn, use, remember, and subjectively appealing. Usability is a term that is usually associated with software engineering and relates to how well computer software assists a user in executing activities (Hoffman & Ritchie, 2013). Learnability, efficiency, memorability, user error management, and user satisfaction are all terms that could be associated with the phrase (Gray, 2017).

One of the most challenging parts of usability is navigation. If the module is poorly designed, end users may become bewildered, detracting from their learning. According to Heines (2012), disorientation can be induced by increased strain or cognitive overhead placed on the user when traversing vast amounts of information. When developers make their modules as useable as possible, their efficacy improves. Disorientation can be reduced by providing explicit instructions or meticulously organizing material (chunking) and providing precise guidance. The primary premise from the start of the design process is to refine the design through evaluation. The evaluation processes enable the makers and designers to integrate user and client responses until the module influences good usability.

According to James, Weiss, and Keep (2012), Taba (1962) utilized a grassroots approach to generating educational materials. Taba believed that it should be created by instructors rather than imposed from on high. This is because teachers are the ones who start the smallest academic unit for the students in the class. Based on this concept, Taba suggested an inductive technique for designing learning materials that begin with a specific design and advance to a more generic design.

Appropriateness. The "empty vessel" or "additive" philosophy of education once championed the lecture style. Recent cognitive psychology research casts doubt on the additive process of new knowledge heaping up on top of old. On the other hand, learning is an active, dynamic process in which the learner constructs his or her mind by constantly forming and modifying connections between new and old information (Barkley, 2018). According to Piaget (1976), children do not receive knowledge passively but rather find and construct knowledge through actions.

Appropriate activities and learning contents must be explicitly mentioned in the learning materials so students can discover and develop knowledge outside of traditional learning. They go on to say that the material's contents must be consistent and corroborative with the learning outcome's contents, that exercises should assess understanding of the given information, that it must provide a variety of exercises with varying levels of difficulty for

different learner abilities, and that exercises should be varied and suited to the subject matter's objectives (Padolina, 2012).

Adequacy. Pattison and Berkas (2015), the final step in learning materials planning is to identify all feasible exercises, implement them in the learning material, then monitor, reflect, and assess them to improve it. Mkandawire (2017) defines various activities as "a network of diverse activities engaged in translating designs into classroom activities and influencing people's attitudes to accept and participate in these activities." Similarly, Gray (2012) considers adding enough activities to learning materials to be taking action toward fulfilling the aim of a curricular plan.

According to Hamza (2012) and Nwagwu (2013), learning materials must include adequate and comprehensive activities to ensure knowledge of ideas and mastery of skills, and objectives must be sufficient to cover the learning outcome fully. According to Osadolor (2017), learning activities must be sufficient in quantity, with varied levels of difficulty, and sufficient in both number and substance to fully develop the learner's concepts and skills.

Validation of Localized Learning Module

Modules are beneficial for improving the quality of education, according to Policarpio (2020), if they have been produced consistently and if all of the module's components are compatible. It must be authenticated, and there are numerous methods for doing so. One of the advantages of solitary modules is

that it allows the trainees to work at their own pace. As a result, it is assumed that trainees do not progress at the same rate and are not equipped to study simultaneously. The ability to select a learning mode for the examination of various themes and subjects is the next goal. Choosing between multiple learning styles is appealing to allow students to solve problems and master new skills using a variety of approaches based on their personal behavior standards.

Understanding course books and additional understanding material, looking at pictures and illustrations, seeing movies and recordings, tuning in to audiotapes, supervising, showing materials, participating in ventures and tries, and participating in critical extra-curricular activities are all examples of Modular Instruction (MI). The third purpose for its existence is to allow users to choose from a vast array of topics inside a random sequence or order. The fourth goal is to create an opportunity for the understudy to recognize their strengths and weaknesses and "reuse" them through healing modules. It is appealing to save understudy time (visit evaluation permits early determination) and allow as many trainees as reasonably expected to achieve the declared targets; we may consider redundancy or a change in the learning method (Ganiron, 2015).

Measured learning is gaining popularity due to its practical application of the rule of individual contrasts, which allows the understudy to progress at his speed. Modules are beneficial for improving the quality of education,

according to Policarpio (2020), if they have been produced consistently and if all of the module's components are compatible.

Research Gap

Several studies have been conducted on the usage of modules as a method of learning. Many researchers recognize the effectiveness of the method, its effects, and its challenges. Dangle (2020) conducted a study to determine instructors, parents, and students' trials, views, and commendations in applying Modular Distance Education. It found that it increases the independent study of the students. Garin (2017) also studied contextualized and localized teaching strategies and found that students exposed to them dramatically improved their application of the concepts in real scenarios. Students who employ localized materials do better than students who use the standard module. The different studies conducted by the researchers primarily focus on secondary education under the Department of Education, highlighting the students' general subjects.

Based on this review, the researcher resolved that there needed to be more studies that observe the localization of modules in TESDA. As of the writing of this paper, there are limited studies related to the creation of localized modules for the skills development of different qualifications under TESDA Administered Schools. The researcher also observed that most of the research and studies regarding the effectiveness and development of modules are

those under primary education or DepEd. There is a limited study about localizing modules, specifically in Food and Beverage Services integrated with STEM competencies.

Definition of Terms

In the context of this study, the following words are defined:

Adequacy. It refers to the quality of being adequate for the intended purpose. In this study, this is used to evaluate the concision and sufficiency of the concepts and skills in the localized instructional module.

Appropriateness. It is the quality of being especially suitable in the context of the study. This examines how relevant the exercises and learning activities are regarding objectives, concepts, and skills.

Concept. Abstract notions are known as concepts. It is acknowledged that they serve as the conceptual pillars of concepts, ideas, and beliefs. This is the configuration and design of the localized module for this investigation.

Content. Content is the information and experiences that are aimed at a reader or audience. In this study, these are the localized module topics, exercises, and activities.

Development. It is the process or act of producing something through time. This in this study refers to the various steps and procedures the researcher went through to produce the intended results of the study.

Evaluators. It is someone whose job is to judge the quality or the value of something. In the study, they were the experts who validated the proposed localized instructional modules in the criteria of usability, appropriateness, and adequacy.

Food and Beverage Services (FBS). This refers to businesses that primarily sell prepared food and beverages for consumption on the premises. Common usage includes restaurants, cafes, fast food outlets, including drive-through or drive-in facilities, and pubs.

Level II. This refers to the National Certificate II awarded by TESDA to persons who have passed a National Competency Assessment.

Localized Module. This is a tool that provides logical, sequential, order, guiding trainees through the content and assessments.

STEM Competencies. This refers to the competencies that a trainee must learn in Science, Technology, Engineering, and Mathematics. This study refers to STEM capabilities that support Technical and Vocational Education and Training (TVET).

Usability. It is the probability of something to be used for a specific purpose. In this study, this refers to the potential of the Localized Instructional Module to be used by FBS NC II trainees.

Validity. It refers to the characteristics of a test measure that answers the question on how well the instrument fulfills the function for which it is being intended. In this study, is the extent of the Localized Instructional Module to

satisfactorily meet the principles of the evaluators regarding usability, appropriateness and adequacy.

Conceptual Framework

In this study, the researcher proposed to develop and validate a localized module in Food and Beverage Services NC II with STEM Competencies for FBS trainees. The study's input is the trainees' profile, including sex, age, and educational attainment. The least mastered STEM competencies were identified and served as the bases of the module development.

While the process undergone by the study is the development of the localized module that includes the construction of the contextual learning matrix to determine the topics based on the training regulation and the layout of the module, this is the preliminary basis for constructing the localized module in FBS NC II. The development of the information sheets and learning activities and the validation of the first draft of the module based on objectives, concepts, skills, usability, appropriateness, and adequacy were observed. Feedback and revision of the first draft were done.

Finally, the output is the validation of the module's final draft, which includes the table of contents, information sheets, task sheets, job sheets, and module exercises. Figure 1 depicts the conceptual framework of this investigation.

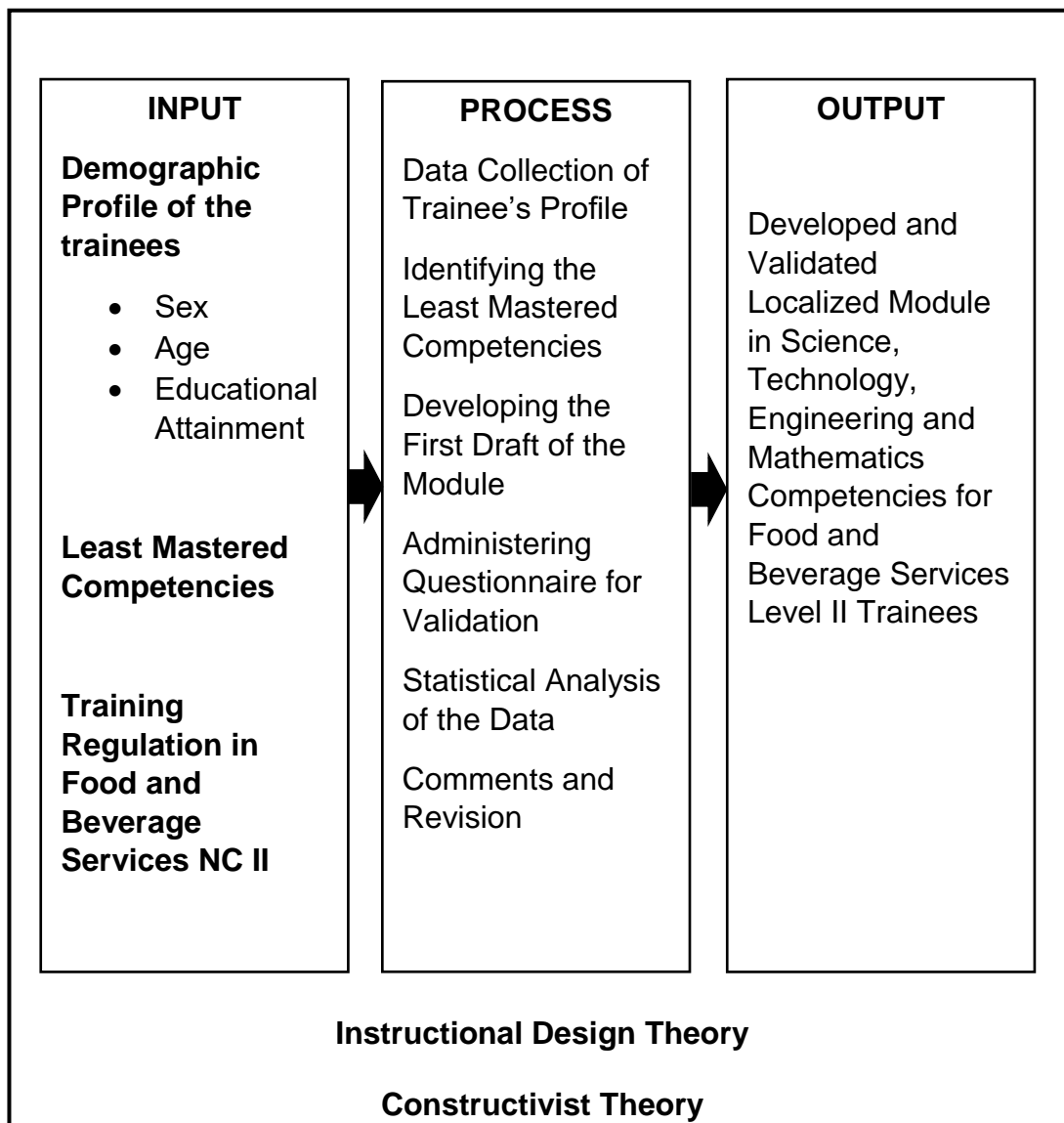


Figure 1. Conceptual Framework of the Study

Chapter III

METHODOLOGY

This chapter describes the research methodology and processes employed in this study. It also contains the research design, research instrument, data collection processes, and statistical treatment for data analysis.

Research Design

The researcher employed the Research and Development (R & D) design in this study. Sugiyono (2014) states that a research and development approach is utilized to create a product and test its efficiency. Furthermore, according to Gall (2003), research and development have two main objectives: first, to produce a product, and second, to test the product's effectiveness. This research developed a localized module validated for validity with Science, Technology, Engineering, and Mathematics competencies for Food and Beverage Service NC II trainees. The researcher used the ADDIE (Analysis, Design, Development, Implement, and Evaluate) Model to construct the instructional modules for the suggested localized module.

There were different stages accomplished with this research. Stage 1 was the planning stage, wherein the instrument for profiling was prepared, identified the respondents conducted profiling for the baseline of the study and analyzed the demographic profile of the respondents, then identified the least

mastered Science, Technology, Engineering, and Mathematics competencies, considered the contents/topic included in the localized module and verified with the training regulation and competency-based curriculum in Food and Beverage Services NC II. Stage 2 was the designing and developing stage. In this stage, lay-out of the module considering the required format of the competency-based learning materials of Technical Education and Skills Development Authority, objectives that are specific, measurable, attainable, realistic and time-bounded, contents and concept that are align with the objectives and the required STEM competencies, and the learning activities that address the learning skills required were considered.

On the other hand, stage 3 was the validation stage. In this stage, the deployment of the developed localized module with the validation instrument to the evaluators. Discussion and soliciting of ideas from the panel of experts who validated the module for clarification and finalization of the proposed localized module. A panel of experts is the FBS trainers, assessors, and industry experts. Stage 4 was the last and final stage, wherein suggestions and comments during the discussion between the validators and the researcher were talking into consideration, and the result was in the validation instrument. The final output is the Developed and Validated Localized Module in Science, Technology, Engineering, and Mathematics competencies for Food and Beverage Services Level II Trainees.

**DEVELOPMENT AND VALIDATION OF LOCALIZED MODULE WITH
SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS
COMPETENCIES FOR FOOD AND BEVERAGE SERVICES LEVEL II
TRAINEES**

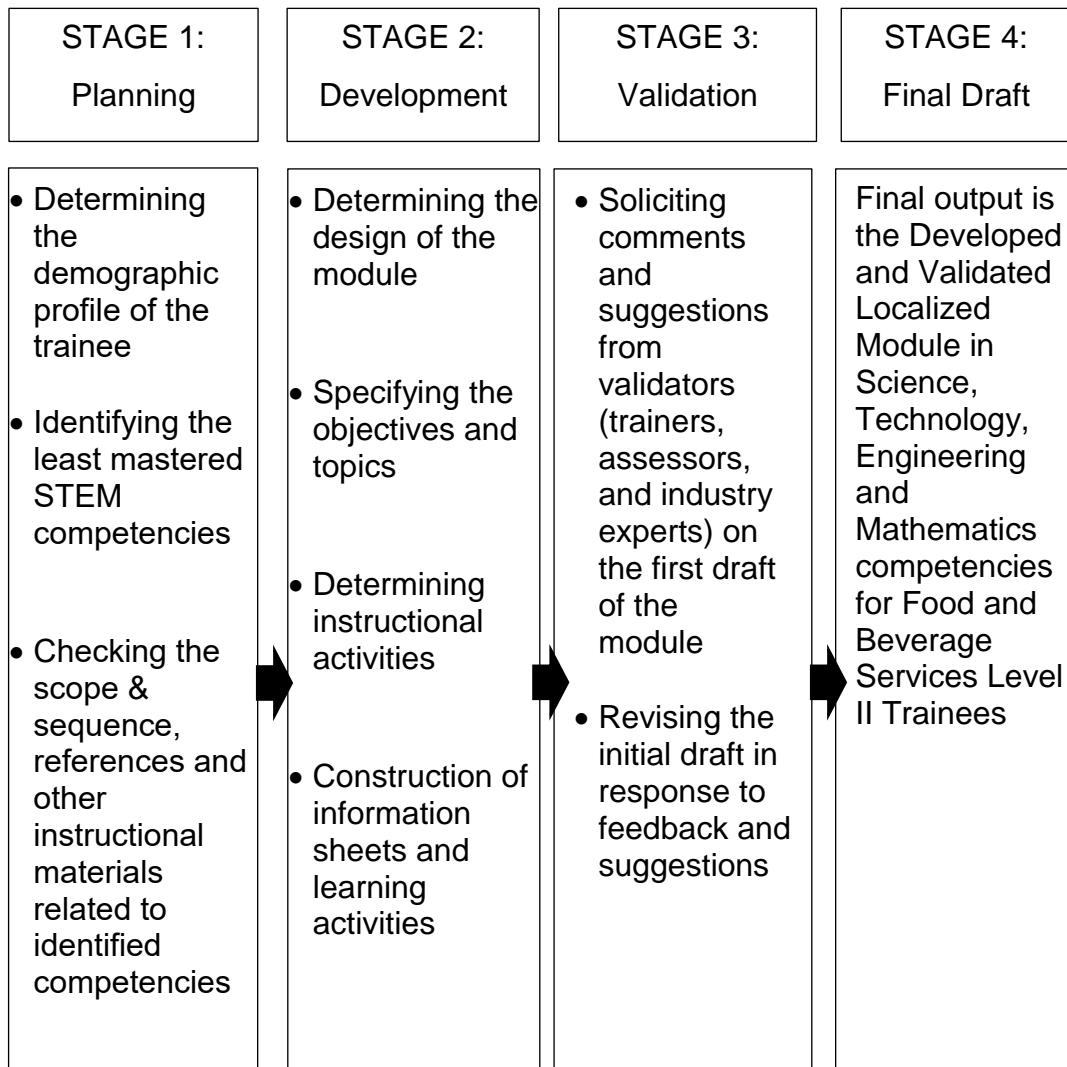


Figure 2. Research Design

Research Locale

The study was conducted at Technical Education and Skills Development Authority -General Santos National School of Arts and Trades, General Santos City. GSNSAT was once known as General Santos National Trade School (GSNTS), which debuted on May 20, 1971, courtesy of Congressman James L. Chiongbian's support for House Bill No. 1803. The statute authorized the school to provide secondary education, short-term courses, and trade technical training. The school progressed due to the good fortune of General Santos City and Batas Pambansa No. 612, supported by former South Cotabato Assemblyman Hon. Jorge P. Royeca.

On June 24, 1983, the name General Santos National School of Arts and Trades (GSNSAT) was approved. Such a name change prepared the way for two-year technical courses to be opened, as well as technical-vocational courses with various concentrations. GSNSAT has taken over the original property, which covers 72,801 square meters. On November 13, 1990, it received its title under the original Certificate Title No. P - 5521. GSNSAT was changed to a TESDA Administered school due to RA 7796, or the TESDA Act of 1994. A Competency-Based Training (CBT) curriculum was used regarding standard competency creation. At present, the institutions offer twenty-eight (28) qualifications from different sectors in Tourism, Metals and Engineering, Construction, Automotive Servicing, Electrical Maintenance, Health and Services, Dressmaking, and Trainers Methodology Level I and II.

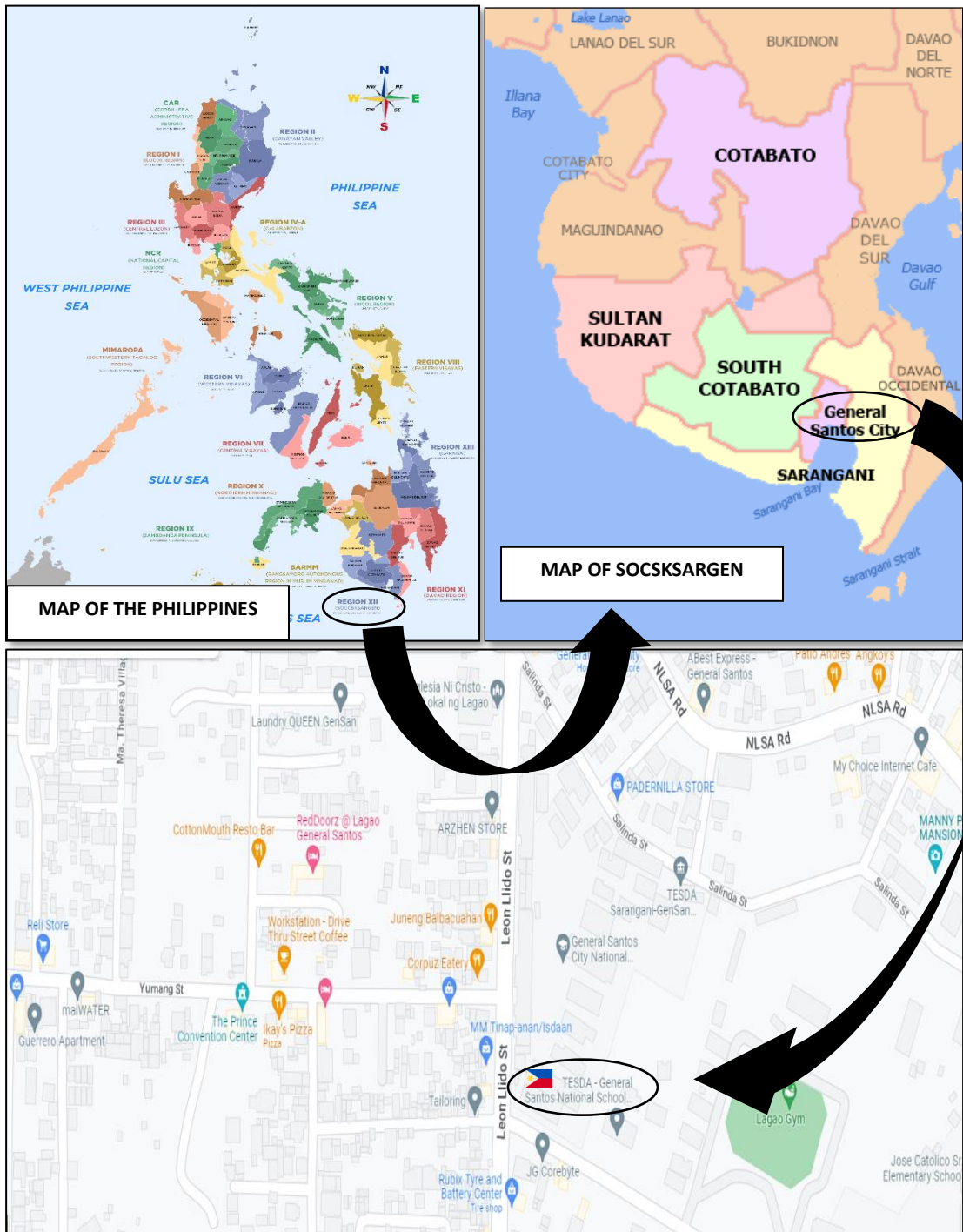


Figure 3. Map of the Locale of the Study

Respondents

The respondents of this study are the twenty-five (25) officially enrolled Food and Beverage Services Trainees of TESDA-General Santos National School of Arts and Trades for the calendar year 2022. They are the recipients of the Training for Works Scholarship Program (TWSP), wherein scholars must be at least 18 years old and complete the 10-year primary education. Complete enumeration was utilized in the selection of the respondents.

Research Instrument

To answer the research questions, different instruments were utilized.

In Part I, the profiling of the trainees, this questionnaire consists of the personal information, work experience, educational attainment, and the characteristics of the learners.

Moreover, the assessment of competencies and the 30-item written test were followed in Part II. In the assessment of competencies, fifteen (15) competencies are listed, each of which was divided into three categories: basic, standard, and core competencies. These are statements answerable by yes or no. In contrast, the written test is a multiple-choice question. The instruments used in parts I and II are standardized pre-training assessment instruments developed by National Tvet Trainers Academy (NTTA) to be utilized by all Technical Education and Skills Development Authority-administered schools.

The researcher carefully studied and analyzed the pre-assessment results and the existing performance criteria checklist under the Food and Beverage Services NC II training regulation provided by Technical Education and Skills Development Authority to determine what contents/topics and skills will be included in the localized module (TESDA).

Lastly, in Part III, the researcher used a modified questionnaire from Cutamora (2016) for the evaluators to validate the learning module based on the following six criteria: aims, concepts, skills, usability, appropriateness, and adequacy. In the appraisal and evaluation of the initial draft of the module by the three sets of evaluators, the researcher utilized a five-point scale rubric to check that the module accurately fits the requirements. The scale and description of the rubric are presented below:

Mean Range	Verbal Descriptive	Interpretation
4.51 – 5.00	Very High Extent	The indicator is extremely well observed in the module.
3.51 – 4.50	High Extent	The indicator is highly observed in the module.
2.51 – 3.50	Moderately Extent	The indicator is moderately observed in the module.
1.51 – 2.50	Low	The indicator is partially observed in the module.
1.00 – 1.50	Very Low	The indicator is extremely low observed in the module.

Data Gathering Procedure

A communication letter was given to the school administrator of General Santos National School of Arts and Trades for permission to conduct the study. Once it was approved, the profiling of the trainees and the assessment of their competencies took place. After that, an analysis of the pre-training assessment of the trainees, the profiling, and the assessment of competencies and written test followed. The outcome of Stage 1 served as the foundation for the coverage of the learning module, and the knowledge to be obtained serves as a guide for writing the first draft.

The researcher-developer extensively reviewed and polished the initial draft of the localized food and beverage services with the Science, Technology, Engineering, and Mathematics Competencies learning module, which is now ready for validation. They also evaluated the module based on its objectives, concepts, skills, usability, appropriateness, and adequacy. The process employed a five-point scale.

The questionnaires, along with the initial draft of the localized module, were personally distributed by the researcher to the evaluators, who are: five (5) FBS Trainers, five (5) FBS Assessors, and five (5) industry experts from TESDA Sarangani – Gensan Accredited institutions. They were given enough time to thoroughly analyze the module, as mentioned above, utilizing the validated tool. The assessment questionnaires, and sample module was

recovered and gathered within three to seven days to prepare for the following procedure.

Groups of evaluation questionnaires were compiled. The responses are statistically handled and evaluated independently for each group. A significant difference test is used to evaluate if each group replied similarly or differently.

The researcher considered the evaluators' constructive remarks and ideas to update and create the final draft of the Localized Module with Science, Technology, Engineering, and Mathematics Competencies for Food and Beverage Services Level II trainees. Furthermore, the recommendation of the adviser and panel member of the researcher are taken into account to ensure that the module is of high quality and ready for use in FBS NC II skills training.

Data Analysis

Statistical tools were utilized to answer the statements presented in the statement of the problem, as found in chapter one of this study. The said tools were further used to analyze the assessment of the evaluators.

Frequency Count and Percentage. The researcher used frequency count and percentage to tally the demographic profile of the trainees in terms of their sex, age and educational. This was also used to determine the components of the localized module in terms of contents and skills.

Weighted Mean. The researcher used weighted mean to consolidate the least mastered STEM competencies of the trainees. This was also used to

consolidate the validation result of the mean gain scores of the three sets of validators.

T-test. t-test for independent samples was used to identify the significant difference of the trainee's sex towards the least mastered STEM competencies.

ANOVA. The researcher used for the analysis to identify the significant difference of the trainee's age and educational attainment towards the least mastered STEM competencies and to determine of the significant difference among the mean gain scores of the trainers, assessors, and industry experts evaluators in terms of objectives, concepts, skills, usability, appropriateness and adequacy of the localized modules.

Ethical Considerations

The researcher ensured that all ethical consideration were followed as mandated by Holy Trinity Ethical Review Board to avoid engaging in practice which may implicitly abuse or exploit those whom she sought to do research with.

The researcher did not force respondents to finish the questionnaire and ensured that all private data provided by respondents was kept confidential. Because of the COVID-19 pandemic, protocols were followed while conducting the research.

Informed Consent. The respondents were informed of the study's purpose, procedures, and anticipated benefits of the study, as well as their right to voluntary participation, the right to withdraw and terminate participation at any time, the right to withhold information, and the confidentiality of the information, and they provided full consent to participate. The study did not encourage or coerce participants. The researcher provided consent forms.

Voluntary Participation. To ensure free will, socioeconomic factors must be considered when deciding if involvement is voluntary. The effort required to define voluntariness depends on several elements, including respondents' ability to resist temptations like money, authority, or persuasion. Avoid unnecessary pressure on research volunteers with limited declining capacity (both real and perceived).

Data Privacy. No permission to access private information is needed because the research instrument contains all necessary data. All personal data remained private. Unauthorized use, alteration, theft, or loss be prevented. The researchers' cabinet and password-protected computer held the data. Names are optional in the informed consent form and study instrument.

The researcher assigned a numeric code to protect participants who disclose such information from data collection to presentation and publication. Research findings were summarized. The informed consent form includes a

confidentiality statement to secure participant data during the study. The researcher shredded all data, equipment, and computer files.

Gender Sensitivity. In this study, there is gender equality in both males and females. Trainees are treated equally by the researcher. All questions in the questionnaire are considered a non- gender-biased to avoid lapses and discrimination.

Cultural Sensitivity. Cultural sensitivity has varied connotations. Trainees' comprehension and communication with trainers improved if they had a better understanding of the term about one's culture. The researcher treats everyone fairly.

Health and Safety Protocols. To make the safety of all individuals involved in this study, the researcher made sure to follow required health and safety protocols in the conduct of the study. Respondents and evaluators are advised to wear face mask during the face-to-face session and social distancing was observed.

Chapter IV

PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA

This chapter addresses the analysis and interpretation of data collected by survey questionnaire. The tabular presentations and conversations were structured around the sub problems listed below.

Demographic Profile of the Trainees

Tables presented below are the result of demographic profile of the trainees in terms of Sex, Age, and Educational Attainment.

Table 1.1

Demographic Profile of Trainees in Terms of Sex

Category	Frequency	Percentage
Male	7	28.00%
Female	18	72.00%
Total	25	100.00%

Table 1.1 shows the Sex of the trainees enrolled in Food and Beverage Services NC II. Based on the result, there are 18 out of 25 (72.00%) are female and 7 out of 25 (28.00%) male. This implies that majority of the enrollees in this qualification are female.

In the report released by TESDA for the first quarter of 2022, in GSNSAT, there are 23.94% female and 76.06% male enrollees. There are more male enrolled over female because, for the first quarter of the year 2022, almost hard trades qualifications are being offered and only three qualifications

for tourism are available. However, the distributional pattern of TVET graduates across sectors has not changed since the 2016 survey. Tourism is a female-dominated sector along with decorative crafts, footwear and leather goods, garments, social community development, and wholesale and retail trading sectors (TESDA-Information and Communication Technology Office, 2022).

Table 1.2

Demographic Profile of Trainees in Terms of Age

Category	Frequency	Percentage
20 yrs. old and below	5	20.00%
21 – 25 yrs. old	7	28.00%
26 – 30 yrs. old	6	24.00%
31 – 35 yrs. old	3	12.00%
36 yrs. old and above	4	16.00%
Total	25	100.00%

Table 1.2 provides information about the age distribution of trainees enrolled in a TESDA skills training program. The table includes data for 25 trainees, showing that most of the trainees are between 21 to 25 years old. This age group comprises 28% of the total trainees and is the largest group enrolled in the program. The second largest group comprises individuals aged 26 to 30, who make up 24% of the trainees. Additionally, 20% of the trainees are below 20 years old, 12% are between 31 to 35 years old, and 16% are 36 years old and above.

In the study released by TESDA in 2019, graduates ranged in age by 11.49 years, with an average age of 30.25. Graduates were between the ages of 15 to 24 years. This is because trainees from this age group seek certification for additional documents or eligibility that can be used for their job application. Training certificates released by TESDA can be an edge to an applicant (TESDA-ICTO, 2019).

Table 1.3

Demographic Profile of Trainees in Terms of Highest Educational Attainment

Category	Frequency	Percentage
Elementary Graduate	0	0.00%
High School Graduate	6	24.00%
Vocational Graduate	0	0.00%
College Graduate	18	72.00%
Master's Graduate	1	4.00%
Total	25	100.00%

Table 1.3 shows the trainees' demographic profile regarding Highest Educational Attainment. It indicates that 18 out of 25 (72.00%) enrolled trainees are college graduates. This is because the training was conducted in the first quarter of 2022, in which trainees were fresh graduates who had difficulty applying for a job because of COVID-19 restrictions. So, while waiting for an opportunity to apply, they prefer to study at TESDA. There are also six

(6) out of 25 (24.00%) trainees who are high school graduates, and only one (1) out of 25 (4.00%) is a master's degree graduate.

A TESDA - Information and Communication Technology Office (2020) found that many 2019 TVET graduates had bachelor's degrees. Bachelor-level undergraduates, dominated by women, followed. Old secondary school graduates placed third. Nearly half of 2019 graduates were bachelors or bachelor units, while few were post-grads. This suggests that even highly educated Filipinos believe TESDA training leads to increased job prospects.

Least Mastered Competencies in Food and Beverage Services NC II

The least mastered food and beverage services NC II competencies were identified to determine what competencies were to be included in the module. Six (6) core competencies were tested on the enrolled trainees in the said qualification.

Table 2 shows the data gathered in identifying the least mastered competencies of Food and Beverage Services NCII trainees. The six (6) core competencies in the table are the competencies stipulated in the training regulation that a trainee must achieve to become competent in the qualification. The overall mean of 2.70, described as moderately mastered, indicates that the six (6) competencies in Food and Beverage Services NC II were at the average level of mastery by the trainees. Trainees can receive and handle guest concerns with a mean of 3.60, described as mastered. This

implies they know the procedure and proper handling of issues with their guests. Welcoming the guest and taking food and beverage orders with a mean of 2.76, and providing food and beverage services to the guest with a mean of 2.64, which describe as moderately mastered, implies that the trainees have an average level of understanding and application of the competencies.

Table 2

Least Mastered STEM Competencies of the Food and Beverage Services Level II Trainees

Items	Mean	Description
1. Prepare the dining room/restaurant area for service.	2.36	Least Mastered
2. Welcome guest and take food and beverage orders.	2.76	Moderately Mastered
3. Promote food and beverage products.	2.48	Least Mastered
4. Provide food and beverage services to the guest.	2.64	Moderately Mastered
5. Provide room service.	2.36	Least Mastered
6. Receive and handle guests concern.	3.60	Mastered
Overall Mean	2.70	Moderately Mastered

However, the result also shows that there are three (3) least mastered competencies of FBS Level II trainees, which are the following; preparing the dining room/restaurant area for service and providing room service, both with a mean of 2.36 and promoting food and beverage products with mean of 2.84. This indicates that these competencies need to be emphasized so that the

level of understanding and application will increase and the required knowledge, skills, and attitude will appropriately master by the trainees. The result revealed that the localized module must contain these three (3) units of competencies to support the needs of the trainees.

Students enrolled in the Bachelor of Science in Hotel and Restaurant Administration at Lyceum of the Philippines University have difficulty performing activities in preparing the dining area. Students find it hard to promote their products because of dietary requirements that need to be considered, as the culture of their guests, and they need more skills in suggestive selling due to poor communication skills. Students also have difficulty transitioning standards in providing services to guests in a restaurant set-up to hotel and room service as it has different guidelines (Ylagan, Apritado, Mendoza, & Tamayo, 2013; Laguador, 2013 & Lyons, 2020)

Significant Difference Between the Least Mastered Competencies in Terms of Sex, Age and Demographic Profile

Tables 3.1, 3.2 and 3.3 show the relationship between the least mastered competencies in terms of sex, age and demographic profile.

The substantial sex-based difference between the least-mastered Competencies among FBS NC II trainees is shown in Table 3.1. The findings showed that when the trainees were categorized based on sex, there is a substantial difference in the least-mastered competences of the trainees. Additionally, it can be deduced that male trainees have higher least mastered

competencies than their female trainee counterparts because the mean of male trainees is 3.48 is larger than that of female trainees with a mean of 2.40.

Table 3.1

Significant Difference Between the Least Mastered Competencies of FBS NC II Trainees in Terms of Sex

Category	Mean	t-value	p-value	Remarks
Male	3.48	3.017	0.012	With Significant Difference
Female	2.40			

There is a significantly different level of involvement between male and female in the context of skills training in the tourism business, particularly in the food service industry. As opposed to men who will merely follow what is taught, women tend to be more inquisitive, hands-on, and eager to explore ideas in the sector. Female students are more likely to understand the situation and carry out the necessary performance when offering food services (Kandampully & Suhartanto, 2013).

The considerable age difference between the FBS NC II trainees' least-mastered STEM competencies is shown in Table 3.2. Results showed that when trainees are categorized according to age, there is a significant difference in the least-mastered competences, with an f-value of 5.081 and a p-value of 0.005.

Wu, Bai, and Zhu (2019) found that individuals aged 18-25 who are enrolled in TVET education tend to perform better compared to other age groups. This could be attributed to their focus on education as a requirement

for securing employment opportunities. They also have better concentration levels and the ability to quickly understand and apply concepts in practical situations. As such, competency-based training delivery, which is widely used in skills training, is a suitable method for this group of trainees. In TVET programs, trainees need to have the ability to quickly understand and apply concepts to practical situations to ensure successful learning outcomes.

Table 3.2

Significant Difference Between the Least Mastered Competencies of FBS NC II trainees in Terms of Age

Category	Mean	F-value	p-value	Remarks
20 yrs. old and below	2.33	5.081	0.005	With Significant Difference
21 – 25 yrs. Old	3.24			
26 – 30 yrs. Old	1.02			
31 – 35 yrs. Old	2.78			
36 yrs. old and above	2.58			

Table 3.3 shows the significant difference between the least mastered STEM Competencies on FBS NC II trainees in terms of Educational background. It is found out that there is no significant difference in the least mastered competencies when they are group in terms of their educational background with f=value of 1.856 and p=value of 0.160. This means that the master’s graduate with a mean of 4.50, college graduate with a mean of 2.68, and highschool graduate with a mean of 2.17 has statistically similar in their least mastered competencies.

Table 3.3

Significant Difference Between the Least Mastered Competencies of FBS NC II trainees in Terms of Educational Attainment

Category	Mean	F-value	p-value	Remarks
Elementary Graduate	<i>0.00</i>	<i>1.856</i>	<i>0.160</i>	No Significant Difference
High School Graduate	<i>2.17</i>			
Vocational Graduate	<i>0.00</i>			
College Graduate	<i>2.68</i>			
Master's Graduate	<i>4.50</i>			

The outcome is consistent with Tilak's (2020) discovery that trainees in housekeeping NC II execute at around the same proficiency levels on most of the assigned tasks. Their students come from a diverse set of students. He implies that through a competency-based training method allowing self-paced learning, trainees in TVET training obtain the necessary information, abilities, and attitudes from the start. As a result, they are all equal in their ability to achieve the necessary criteria set by TESDA.

Appropriate STEM Competencies for Localized Module

Table 4 shows the appropriate STEM competencies embedded in the developed localized module. These competencies are standardized by the International Labour Organization and Technical Education and Skills Development Authority curriculum developers. Curriculum writers and trainers are encouraged to contextualize the learning activities in their qualifications to ensure their program's relevance since the STEM in TVET aims to reinforce

existing STEM competencies in TESDA qualifications through STEM-oriented learning activities and assessments.

Table 4

**Appropriate STEM Competencies for Localized Module
in Food and Beverage Services NC II Trainees**

Unit of Competency	Learning Outcome	STEM Competencies
Prepare the dining room/restaurant area for service	Take table Reservations	STEM knowledge
	Prepare service stations and equipment	STEM knowledge Multiliteracies
	Set up the tables in the dining area	Thinking Skills
	Set the mood/ambiance of the dining area	Multiliteracies Thinking Skills
Promote food and beverage products	Know the product	STEM knowledge Multiliteracies
	Undertake suggestive selling	Multiliteracies
	Carry out upselling strategies	Socio-emotional Intelligence
Provide Room Service	Take and process room service orders	STEM knowledge Socio-emotional intelligence
	Set up trays and trolleys	Multiliteracies
	Present and serve food and beverage orders to guests	Socio-emotional Intelligence Multiliteracies
	Present room service account	Socio-emotional Intelligence Multiliteracies
	Clear away room service equipment	Thinking Skills Multiliteracies

Based on the International Labour Organization (2018) assessment of the evaluation of several international structures on the integration of STEM in TVET, STEM competencies that support TVET have four significant domains: STEM knowledge, thinking skills, multiliteracies, and socio-emotional

intelligence. This STEM competency will develop human flourishing as the maximum form of self-actualization.

The STEM competencies for preparing the dining room/restaurant area for service include STEM knowledge for taking table reservations and preparing service stations and equipment. Additionally, setting up the tables in the dining area requires thinking skills, while setting the mood/ambiance of the dining area requires multiliteracies.

The STEM competencies for promoting food and beverage products include STEM knowledge for knowing the product and multiliteracies for undertaking suggestive selling. Furthermore, carrying out upselling strategies requires socio-emotional intelligence.

For providing room service, the STEM competencies include STEM knowledge for taking and processing room service orders and multiliteracies for setting up trays and trolleys. Presenting and serving food and beverage orders to guests requires socio-emotional intelligence, while presenting room service accounts requires socio-emotional intelligence and multiliteracies. Finally, clearing away room service equipment requires thinking skills and multiliteracies.

Overall, the developed localized module includes various STEM competencies essential for hospitality staff to effectively perform their job duties and provide high-quality service to guests. These competencies cover

various areas, including STEM knowledge, multiliteracies, thinking skills, and socio-emotional intelligence.

Components of Localized Module with STEM Competencies

Tables 5.1 and 5.2 show the components of localized module with STEM Competencies in terms of contents, and skills.

Table 5.1

Components of Localized Module with STEM Competencies of FBS NC II Trainees in terms of Contents

Unit of Competency	Content
Prepare the dining room/restaurant area for service	Food service operation
	Taking table reservation
	Food Service Area and customers facilities
	Table layout and set up
	Napkin folding styles
	Table skirting/Boxing table
Promote food and beverage products	General Information on food products
	Techniques in dealing customers with special needs
	Types of menus and wine list
	Customer needs, wants and preferences
	Guidelines in Suggestive selling
Provide Room Service	Introduction to room service
	Take and confirm room service order
	Setup trays and trolleys
	Present room service meals and beverages to the guest
	Room service accounts
	Guidelines in removing room service equipment and materials

Table 5.1 shows the contents that were included in the developed localized module. It contains the three (3) core competencies of FBS NC II. The data outlines the content associated with the Unit of Competency for three

critical service areas in the hospitality industry - preparing the dining room/restaurant area for service, promoting food and beverage products, and providing room service.

The content for preparing the dining room/restaurant area for service includes food service operations, taking table reservations, the food service area, customers' facilities, table layout, and set up. It also covers napkin folding styles, table skirting/boxing tables, and other related skills necessary for preparing the dining room/restaurant area for service.

The content for promoting food and beverage products includes general information on food products, techniques in dealing with customers with special needs, types of menus and wine lists, and customer needs, wants, and preferences. Additionally, it provides guidelines for suggestive selling, which is the art of recommending specific menu items to customers.

For providing room service, the content includes an introduction to room service, taking and confirming room service orders, setting up trays and trolleys, presenting room service meals and beverages to guests, room service accounts, and guidelines for removing room service equipment and materials.

Overall, the content is comprehensive and covers all the necessary aspects of these service areas in the hospitality industry. By mastering the content, hospitality staff can effectively perform their job duties, provide high-quality service to guests, and contribute to the success of their organization.

Table 5.2

**Components of Localized Module with STEM Competencies
of FBS NC II Trainees in terms of Skills**

Unit of Competency	Skills
Prepare the dining room/restaurant area for service	Taking table reservation
	Performing mes en place
	Setting up table
	Performing 10 basic napkin folds
	Performing table skirting
Promote food and beverage products	Personalizing Menu card
	Performing suggestive selling
	Promoting food and beverage products to the guest
Provide Room Service	Taking and processing room service orders
	Setting up trays and trolleys
	Presenting room service meals and beverage services
	Presenting room service accounts
	Clearing room service area

Table 5.2 shows the unit of competency and the associated skills required for FBS NC II trainees to prepare the dining room/restaurant area for service, promote food and beverage products, and provide room service.

For preparing the dining room/restaurant area for service, the required skills include taking table reservations, performing mes en place (preparing and organizing ingredients and tools), setting up tables, performing ten basic napkin folds, and performing table skirting (arranging tablecloths and skirts).

For promoting food and beverage products, the required skills include personalizing the menu card, performing suggestive selling (suggesting

specific menu items to guests), and promoting food and beverage products to guests.

For providing room service, the required skills include taking and processing room service orders, setting up trays and trolleys, presenting room service meals and beverage services, presenting room service accounts, and clearing the room service area.

These skills are essential for hospitality staff to deliver high-quality service to guests and reflect the competency required to perform the job duties associated with these service areas in the hospitality industry.

Evaluation of the Developed Localized Module

The evaluators assigned grades based on six criteria: objectives, content, skills, usability, appropriateness, and adequacy. The results of this evaluation are shown in the tables 6.1, 6.2, 6.3, 6.4, 6.5, and 6.6.

Table 6.1 shows the mean gain scores of the trainers, assessors, and industry experts on evaluating the localized modules regarding objectives. With an overall mean of 4.67, the objectives of the localized module were rated as very high. It is also noted that the evaluators find the objectives to be clearly and specific, as shown by their rating of very high, with a mean of 4.80. The other indicators of the subject were also rated very high time bounded with a mean of 4.73, attainable and realistic with a mean of 4.67, except for the

objectives are measurable with a mean of 4.47 as it is rated high by the evaluators.

Table 6.1

Mean Gain Scores of the Trainers, Assessors, and Industry Experts on the Evaluation of the Localized Module in Terms of Objectives

Items	Mean	Description
1.The objectives are clearly stated and specific.	4.80	Very High
2.The objectives are measurable.	4.47	High
3.The objectives are attainable.	4.67	Very High
4.The objectives are realistic.	4.67	Very High
5.The objectives are time bounded.	4.73	Very High
Overall Mean	4.67	Very High

According to Torre Franca (2017), learning module objectives are specific competencies that students must master before going on to the following session. In order to discover and interpret the needs of the students in the specific course, he establishes clearly defined objectives relevant to the topics of each module's lesson. Learning objectives serve as a guide to choosing the appropriate lesson content, learning activities, and evaluation in order to achieve a more thorough learning progression. Module objectives can be viewed as the foundation of instruction once a course is completed.

Table 6.2 shows the mean gain scores of the evaluators in terms of concepts. Concepts were overall rated as very high, with a mean of 4.76. In particular, evaluators believe that the concepts are related to FBS NC II

prescription with a mean of 4.87 which is interpreted as very high. They also perceived that the vocabulary used in the localized module is simple with a mean of 4.80, based on the performance criteria with a mean of 4.73, within the curriculum expectancies with a mean of 4.73, and systematically and sequentially arranged with a mean of 4.67. The evaluators rated all the indicators as very high per the corresponding mean.

Table 6.2

Mean Gain Scores of the Trainers, Assessors, and Industry Experts on the Evaluation of the Localized Module in Terms of Concepts

Items	Mean	Description
1. The knowledge and concepts are based on the performance criteria of FBS NC II.	4.73	Very High
2. The concepts are within the curriculum expectancies in FBS NC II.	4.73	Very High
3. The concepts are systematically and sequentially arranged.	4.67	Very High
4. The vocabulary used in the localized module is simple.	4.80	Very High
5. The concepts are related to FBS NC II prescription.	4.87	Very High
Overall Mean	4.76	Very High

Vergara (2017) states that instructional materials contain objectives-related courses. Concept review and selection emphasize critical ideas based on students' comprehension. Thus, lesson sequencing is a teacher's ability to anticipate a learning continuum to meet grade-level standards. Material sequencing ensures instructional module consistency and efficiency.

Table 6.3

**Mean Gain Scores of the Trainers, Assessors, and Industry Experts
on the Evaluation of the Localized Module in Terms of Skills**

Items	Mean	Description
1.The skills developed in the exercises are congruent to the objective.	4.67	Very High
2.The skills developed are varied and developmental.	4.67	Very High
3.The higher order thinking skills like comprehension, analysis, application, and computation are enhanced.	4.67	Very High
4.The exercises promote experiences for individual assessment of one's progress in FBS NC II.	4.60	Very High
5.The exercises are skill – based, challenging, and interesting.	4.60	Very High
Overall Mean	4.64	Very High

Table 6.3 shows the evaluators' evaluation of the localized module regarding Skills. The overall mean of 4.64, described as very high, shows that the localized module contains the required skills for the trainees. Evaluators are persuaded that the skills established in the exercises are consistent with the objective, varied and developmental, and enhanced higher-order thinking skills with a mean of 4.67. It also encourages experiences for special assessment and is skill-based, thought-provoking, and engaging, with a mean of 4.60. These indicators are described as very high based on the given mean.

Curriculum goals, which include learners' needs, ideas, interests, and traits, must guide module organization. Learning requires engaging activities that build knowledge, skills, and values. Module learning activities should have

goals, be valuable, and be achievable. Information involvement by learners promotes active, authentic, constructive, and collaborative learning (Morante, 2018).

Table 6.4

Mean Gain Scores of the Trainers, Assessors, and Industry Experts on the Evaluation of the Localized Module in Terms of Usability

Items	Mean	Description
1. The exercises are logically presented from the simplest to the complex ones.	4.73	Very High
2. The instructions set exercises are clear and easy to follow.	4.93	Very High
3. The print character is presented in vivid letters.	4.80	Very High
4. Some exercises are fitted for individual and group work.	4.60	Very High
5. The exercises can be adopted in other FBS NC II book.	4.93	Very High
Overall Mean	4.80	Very High

Table 6.4 shows the evaluation of the evaluators in terms of usability. Evaluators observed very high module usability with an overall mean of 4.80. This indicates that the localized module is easy to use, effective, and efficient in gaining the required knowledge and skills. Evaluators believed that instructions are clear and easy to follow with a mean of 4.93, can be adopted in other FBS books with a mean of 4.93, a print character is presented in vivid letters with a mean of 4.80, exercises presented from simple to complex with a mean of 4.73 and fitted for individual and group work with a mean of 4.60.

Ho, Chung, and Lee (2020) argue that modular rules allow students to choose what to study and how to acquire it actively. Learning resources that are easy to use, organized from simple to sophisticated, and well-designed will help people reach their goals. Modern students require materials that promote usability, improvement, and learning.

Table 6.5

Mean Gain Scores of the Trainers, Assessors, and Industry Experts on the Evaluation of the Localized Module in Terms of Appropriateness

Items	Mean	Description
1. The contents of the localized module are congruent and corroborative with the contents of the learning competency.	4.53	Very High
2. The exercise measure the study.	4.67	Very High
3. The localized module provides for different exercises that have varied levels of difficulties for different trainee's capabilities.	4.73	Very High
4. The exercises are varied and suited to the objectives of the lesson.	4.67	Very High
5. The exercises enhance the trainee's STEM Skills.	4.60	Very High
Overall Mean	4.64	Very High

Likewise, Table 6.5 indicates that the localized module was appropriate as learning materials in FBS NC II with a high overall mean of 4.64. The contents provide for different exercises that have varied levels of difficulties for different trainee's capabilities, with a mean of 4.73; the exercise measures the study and is varied and suited to the objectives of the lesson with a mean of 4.67, enhancing the trainee's STEM Skills with a mean of 4.60, contents are

congruent and corroborative with the contents of the learning competency with a mean of 4.53.

Funa (2019) believes student learning resources should address subject matter objectives. It should give pupils the knowledge and skills they need to achieve proficiency. Those materials quickly improve instructors' and students' knowledge, skills, and talents. Topic and student comprehension must match materials. It should show current, credible, and valid examples that support learning and curricular standards.

In terms of adequacy, Table 6.6 shows that the mean for all items is 4.72, indicating a very high" level of satisfaction with the exercises. The objectives for every lesson are sufficient to fully cover the learning competency as it was rated the highest mean of 4.87. This suggests that the exercises were effective in meeting the intended learning outcomes. Similarly, the exercises are adequate and comprehensive, sufficient in number and substance, and sufficient in quantity and varying difficulty levels, respectively, with a mean of 4.73. These further suggest that the exercises were well-designed and met the needs of the learners. The exercises were presented in STEM learning activities with a mean of 4.60, rated as very high; this suggests that there may be room for improvement in how the exercises are presented. Overall, the data suggest that the exercises effectively taught FBS concepts and skills and were well-received by the learners.

Table 6.6

Mean Gain Scores of the Trainers, Assessors and Industry Experts on the Evaluation of the Localized Module in Terms of Adequacy

Items	Mean	Description
1. The exercises are adequate and comprehensive to ensure understanding of concepts and mastery of skills.	4.73	Very High
2. The objectives for every lesson are sufficient to fully cover the learning competency.	4.87	Very High
3. The set of exercises are sufficient both in number and in substance to fully develop the FBS concepts and skills among the trainees.	4.67	Very High
4. The set of exercises is sufficient in quantity and varying levels of difficulty.	4.73	Very High
5. The exercises are presented in STEM learning activities.	4.60	Very High
Overall Mean	4.72	Very High

Contextualized modules assist students in developing the requisite abilities, according to Aban (2019). Students must have relevant examples and exercises written at their level and grouped from simple to sophisticated. He also noted that using instructional resources that do not foster learning competencies may hurt students and propagate misinformation.

Table 6.7 shows the overall evaluation of the evaluators in the six criteria, which were rated very high. This implies that the indicators are observed in the learning module up to a great extent. Usability has the highest mean of 4.80, followed by concepts at 4.76, adequacy at 4.72, objectives at 4.67, and skills and appropriateness at 4.64.

Table 6.7

Summary Results on the Mean Gain Scores of the Trainers, Assessors and Industry Experts on the Evaluation of the Localized Module

Indicators	Mean	Description
1. Objectives	4.67	Very High
2. Concepts	4.76	Very High
3. Skills	4.64	Very High
4. Usability	4.80	Very High
5. Appropriateness	4.64	Very High
6. Adequacy	4.72	Very High
Overall Mean	4.71	Very High

Bayle (2014) produced and validated a Physics laboratory manual and had eight professors grade it for appropriateness, adequacy, and acceptance. Ganiron (2015) also designed and tested a Physics program for architecture students. His study validated module contents for appropriateness, usability, and adequacy. The experts agreed that the item met the requirements of appropriateness, usability, and content adequacy.

The output of the ANOVA calculation used to determine whether a significant difference between the evaluators was found is shown in Table 7. Based on the result given above, p-values were all greater than 0.05 level of significance; thus, the null hypothesis of no significant difference between the mean gain scores on the evaluation of localized module with STEM competencies in terms of objectives, concepts, skills, usability, appropriateness, and adequacy is accepted.

Table 7

Significant Difference on the Mean Gain Scores on the Evaluation of Localized Module with STEM Competencies Among the Trainers, Assessors, and Industry Experts - Evaluators

Category	Mean			F-value	p-value	Remarks
	Trainers	Assessors	Industry Experts			
Objectives	4.68	4.76	4.56	0.250	0.783	No Significant Difference
Concepts	4.88	4.84	4.56	1.390	0.286	No Significant Difference
Skills	4.52	4.76	4.64	0.443	0.652	No Significant Difference
Usability	4.88	4.84	4.68	0.618	0.556	No Significant Difference
Appropriateness	4.48	4.72	4.72	0.314	0.736	No Significant Difference
Adequacy	4.76	4.80	4.60	0.483	0.629	No Significant Difference

An F-value of 0.250 and a p-value of 0.783 demonstrates that the three sets of evaluators were similar in how they assessed the localized module's objectives. Additionally, the concepts contained in the localized module did not differ significantly, with an F-value of 1.390 and a p-value of 0.286. This indicates that the objectives and concepts presented in the localized module were considered appropriate, suitable, and prescribed by the assessors. The three sets of assessors' mean gain scores for the remaining four criteria—skills (F-value of 0.443 and P-value of 0.652), usability (F-value of 0.618 and P-value of 0.556), appropriateness (F-value of 0.314 and P-value of 0.736), and

sufficiency—were not significantly different (F-value of 0.483 and P-value of 0.629).

This implies that the locally generated module is authentic. It incorporates and develops abilities that aid in achieving specific qualification objectives, allows for developing higher cognitive skills, and is appropriate for the trainees' vocabulary and ability. It was also discovered that it is, for the most part, incredibly usable, acceptable, and appropriate for the purpose for which it was designed.

According to Tomlinson (2014), who wrote a book about developing instructional materials, more and more public and private institutions understand that creating localized instructional resources will boost student accomplishment and learning. Adopting localized information can improve students' learning, according to the findings of a study conducted by Sorcar, Strauber, Loyalka, Kumar, and Goldman (2017).

On the other hand, Reyes, Ingreso, and Hilario (2019) described the development and implementation of contextualization in mathematics education. They discussed that educators should focus on developing teachings relevant to the student's daily lives to encourage student participation because they can relate to the course; discussions should center on instances that participants can see in their town or community. Localized teaching resources can also improve students' reading skills.

In developing instructional materials for trainees, it is essential to consider factors such as objectives, concepts, skills, usability, appropriateness, and adequacy. It must be at the level at which trainees can easily understand what they are reading and perform the required skills. Localizing instructional materials help trainees to appreciate the application of their gained learning in a real work scenario. The localized modules must be plan oriented, with simple approaches, and approaches are probabilistic, as suggested by Reigeluth (2022).

In summary, to create effective instructional materials, it is important to consider instructional design theory and constructivist learning theory. This means aligning the materials with training objectives, making them user-friendly and appropriate for the audience, providing clear explanations of concepts and skills in a way that allows for active learner engagement, covering the entire training curriculum in a logical and meaningful sequence, and localizing them for greater relevance and accessibility to the trainees' cultural and contextual backgrounds. Instructional designers can create effective materials that promote learners' competencies and success by considering these factors.

Chapter V

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents the summary, findings, conclusions, and recommendations of the study.

Findings

This study aimed to develop and validate a localized module with science, technology, engineering, and mathematics competencies for food and beverage services level II trainees. This study was conducted at Technical Education and Skills Development Authority – General Santos National School of Arts and Trades, Lagao, General Santos City. The respondents were the 25 officially enrolled trainees in FBS NC II for the first quarter of the calendar year 2022. The evaluators of the developed modules were categorized into three (3), five from the trainers, five from the assessors, and five from industry experts.

The frequency distribution, weighted mean, and percentage were used in this study's presentation and analysis of data. The t-test was also utilized to determine the significant difference in the trainee's sex toward the least mastered STEM competencies. In contrast, the t-test was used to determine the significant difference in the trainee's age and educational background towards the least mastered STEM competencies. To determine the significant difference among the top gain scores of trainers, assessors, and industry

experts' evaluators in terms of objectives, concepts, skills, usability, appropriateness, and adequacy of the localized module, ANOVA was used by the researcher. The following are the findings of the study.

Demographic Profile of the Trainees

- 1.1. There are 18 (72.00%) females and seven (7) (28.00%) males enrolled in Food and Beverage Services NC II for the first quarter of the C.Y. 2022.
- 1.2. Seven (7) trainees are 21 – 25 years old, 28% of the total population; six (6) trainees are 26 – 30 years old, 24%. Five (5) trainees are 20 years old and below, which is 20%; four (4) trainees are 36 years old and above, which is 16%; and three (3) trainees who are 31- 35 years old, which are 12% of the total population.
- 1.3. For the highest educational attainment of the trainees, 18 trainees (72.00%) are college graduates, six (6) trainees (24.00%) are high school graduates, and one (1) trainee (4.00%) is a master's graduate.

2. Least Mastered Competencies of Food and Beverage Services NC II

There are six (6) core competencies in FBS NC II, and only three (3) competencies were considered least mastered. The first is preparing the dining room/restaurant area for service, with a mean score of 2.36.

Second, Promote food and beverage products with a mean score of 2.48. Third, provide room service with a mean score of 2.36. These three competencies were the basis for the development of the localized module.

3. Significant Difference Between Least Mastered Competencies on Food and Beverage Services NC II

- 3.1. In terms of sex, it is found out that there is a significant difference between the least mastered competencies and sex of the trainees with a t-value of *3.017* and a p-value of *0.012*.
- 3.2. In terms of age, with an F-value of *5.081* and a P-value of *0.005*, there is a significant difference between the least mastered competencies and the age of the trainees.
- 3.3. In terms of educational attainment, with a F-value of *1.856* and a P-value of *0.160*, there is no significant difference between the least mastered competencies and the educational attainment of the trainees.

4. Appropriate STEM Competencies Developed in the Localized Module

Based on the findings of the study, Science, Technology, Engineering and Mathematics competencies that were included in the development of the module are STEM knowledge, Thinking skills, Multiliteracies and Socio-emotional intelligence. These are the STEM

competencies that were stipulated in the training regulation and competency standards of food and beverage services NC II.

5. Components of the Localized Module with STEM Competencies in Food and Beverage Services NCII

5.1. In terms of contents, the following are the contents in the developed localized module: food service operation, taking table reservations, food service area and customer's facilities, table layout and set up, napkin folding styles, and table skirting/boxing table are the contents, general information on food products, techniques in dealing customers with special needs, types of menus and wine list, customer need, wants and preferences and the guidelines in suggestive selling, introduction to room service, take and confirm room service order, setup trays and trolleys, present room service meals and beverages to the guest, room service accounts, and guidelines in removing room service equipment and materials.

5.2. In terms of skills, the following are included in the developed localized module: taking table reservation, performing mes en place, setting up table, performing 10 basic napkin folds, performing table skirting, personalizing Menu card, performing suggestive selling, promoting food and beverage products to the guest, taking and processing room service orders, setting up

trays and trolleys, presenting room service meals and beverage services, presenting room service accounts, and clearing room service area.

6. Mean Gain Scores of the Trainers, Assessors, Industry – Experts Evaluators of the Localized Module

- 6.1. The overall mean evaluation for the localized module in terms of objectives which is 4.67, described as very high, indicates that the indicators are observed in the learning module to a very high degree.
- 6.2. The overall mean evaluation for the localized module in terms of concepts which is 4.76, described as very high, indicates that the indicators are observed in the learning module to a very high degree.
- 6.3. The overall mean evaluation for the localized module in terms of skills which is 4.64, described as very high, indicates that the indicators are observed in the learning module to a very high degree.
- 6.4. The overall mean evaluation for the localized module in terms of usability, which is 4.80, described as very high, indicates that the indicators are observed in the learning module to a very high degree.

6.5. The overall mean evaluation for the localized module in terms of appropriateness which is 4.64 describe as very high indicates that the indicators is observed in the learning module to a very high degree.

6.6. The overall mean evaluation for the localized module in terms of usability, which is 4.80, described as very high, indicates that the indicators are observed in the learning module to a very high degree.

7. Significant Difference of The Mean Gain Scores on the Evaluation of Localized Module with STEM Competencies Among the Evaluators

7.1. Correlation test showed that the evaluation of the localized module among the evaluators in terms of objectives has no significant difference (F-value =0.250, p-value =0.783).

7.2. Correlation test showed that the evaluation of the localized module among the evaluators in terms of concepts has no significant difference (F-value =1.390, p-value =0.286).

7.3. Correlation test showed that evaluation of the localized module among the evaluators in terms of skills has no significant difference (F-value =0.443, p-value =0.652).

7.4. Correlation test showed that evaluation of the localized module among the evaluators in terms of usability has no significant difference (F-value =0.618, p-value =0.556).

- 7.5. Correlation test showed that evaluation of the localized module among the evaluators in terms of appropriateness has no significant difference (F-value =0.314, p-value =0.736).
- 7.6. Correlation test showed that evaluation of the localized module among the evaluators in terms of adequacy has no significant difference (F-value =0.483, p-value =0.629).

Conclusions

The findings of the study, led to the following conclusions:

1. Food and Beverage Services NC II is a female-dominated qualification with 72% of the total population. Most of the trainees are 21 – 25 years old, with 28% of the total population and 72% of them being college graduates.
2. Out of the six (6) core competencies, only three (3) competencies are least mastered, namely, preparing the dining room/restaurant area for service, promoting food and beverage products, and providing room service.
3. There is a significant difference between the least mastered competencies in terms of sex with a t-value of 3.017 and p-value of 0.012, in terms of age with an f-value of 5.081 and p-value of 0.005, and in terms of educational attainment with f-value of 1.856 and p-value of 0.160.

4. STEM knowledge, thinking skills, multiliteracies, and socio-emotional intelligence were the STEM competencies integrated with the developed localized module.
5. The developed localized module included the following sections: Prepare the dining room/restaurant environment for service, promote food and beverage products, and provide room service. Each section contains respective required contents and required skills.
6. All six criteria; objectives, concepts, skills, usability, appropriateness, and adequacy, were given very high ratings by the three groups of evaluators that indicates that the module scored very high ratings across all six criteria, which suggests that the indicators of the criteria were highly observed in the module. In other words, the evaluators found that the module was effective in achieving its stated objectives, covered relevant concepts and skills, was easy to use, suitable for its intended audience, and provided sufficient and appropriate content.
7. The mean gain scores of the Food and Beverage Services trainers, assessors, and industry experts do not significantly differ from one another. This suggests that the locally produced module is valid; this indicates that it incorporates and develops abilities that help reach certain qualification objectives, provides for the development

of Science, Technology, Engineering and Mathematics competences, higher cognitive skills, and is appropriate to the trainees' vocabulary and ability.

Recommendations

Based on the findings and conclusions, the following recommendation was made.

1. To promote gender equality in the Food and Beverage Services NC II training program, it is essential to encourage all potential trainees to recognize that this field is open to everyone and not just limited to female trainees. By doing so, the program can attract a diverse range of candidates and create an inclusive learning environment that values and respects the unique contributions of each trainee, regardless of their gender.
2. To ensure comprehensive training, the development of the localized module may cover the entirety of the qualification. This is because each component of the qualification is equally important and necessary for the trainees to acquire the competencies required for their chosen field. A localized module that covers the entire qualification will provide a more holistic approach to training and will better equip the trainees with the knowledge and skills they need to succeed in their careers.

3. To ensure that all trainees can effectively understand and benefit from the training, it is important to identify and address the factors that may hinder their comprehension, regardless of their gender, age, or educational background. By doing so, the training can be tailored to the specific needs of the trainees, thereby enhancing their overall learning experience and improving their competency in the field.
4. TESDA may conduct more comprehensive training programs and provide resources for its trainers to effectively integrate STEM competencies in TVET. By doing so, trainers may effectively incorporate STEM competencies in their teaching, which may lead to better learning outcomes for the trainees. Additionally, TESDA may collaborate with industry experts and other stakeholders to develop and implement STEM-based curriculum and training programs that are relevant to the current demands of the industry.
5. To ensure effective delivery of training, trainers may be equipped with the necessary skills to develop localized modules that include relevant content and skills that can be applied by the trainees in their local context. TESDA should provide more training opportunities and resources for trainers to integrate STEM competencies in TVET and develop localized modules that are aligned with the needs and characteristics of the trainees.

6. The developed localized module may be subjected for evaluation by the committee on developing learning materials composed of various stakeholders, such as the curriculum head, trainers, sector chairperson, and program registration focal. The feedback gathered from this evaluation may be used to further improve the module and ensure that it aligns with the needs of the trainees and the goals of the TVET program.
7. This may encourage other TESDA-administered schools to develop their own localized modules, not only for FBS NC II but also for other qualifications. This will promote the use of relevant and localized training materials that are tailored to the specific needs and situations of the trainees, ultimately resulting in more effective and efficient learning outcomes. In addition, the sharing and dissemination of these localized modules may also foster collaboration and knowledge exchange among trainers and institutions, leading to continuous improvement and innovation in TVET delivery.

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