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Evaluation of self-directed learning module in food and service management as instructional material in remote modality

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Abstract

This study is designed to evaluate the self-directed learning module in food and service management as instructional material in remote modality. It assessed the level of student performance, students' acceptance of the self-directed learning module for food service management, efficacy of the components of self-directed learning module and the challenges faced by the students in the use of self-directed learning module for food and service management. It also tested the significant difference between the pre-test and post-test scores of the students in food service management and the significant relationship between the students' performance and their assessment of the SLM, efficacy of SLM and challenges in SLM. The study used descriptive quantitative and experimental research designs. The participants of the study were the 126 first and second year level students of the Bachelor of Technical Vocational Teacher Education at Dalubhasaan ng Lungsod ng Lucena. There were two sets of instruments: pretest and posttest assessments and self-constructed survey questionnaire. Statistical analyses used were frequency count and percentage, weighted mean, paired T-Test and Pearson R. was used to answer the research question 6. The findings showed that students obtained higher ratings in the post-test than the pre-tests in all the indicators tested implying that the self-directed learning module helped students improve their level of knowledge. The results also showed that students assessed the SLM as 'highly manifested' in all the variables tested. Similarly, the efficacy of the components of the self-directed module for food service management were assessed 'highly observed' indicating students' acceptability of the SLM. However, the students were challenged by the use of the SLM because there was no support from the family and/or community, no available materials as required for the tasks, performance tasks require a lot of time, module has poor designs, performance tasks are difficult to follow. The study further revealed significant statistical difference between the pre-test and post-test scores of the students but no significant relationship between the students' level of knowledge and their assessments of the SLM, efficacy of the SLM and the challenges faced in using the SLM. The study suggests the continuous use of the SLM and the possibility of extending the same format of the module to other subjects with rooms for improvements. The college may support the development of SLM in various subjects and organize training programs for students on the better utilization of the module.

Keywords: *self-directed learning module, food service management, instructional material, SLM, student performance*

1. Introduction

At the height of the COVID-19 pandemic, educational institutions around the world shifted from face to face to distance learning modality. It caused burden to everyone especially to the students. According to Mohammed et al. (2020), the academic institutions have been enforced to entirely cancel face-to-face teaching including laboratories and other learning experiences as a mitigation step against the risk posed by the Coronavirus. In the Philippines, the academic institutions were governed by the RA 11469, otherwise known as the "Bayanihan to Heal as One Act," which promulgates the guidelines on flexible learning. The provisions of the mandate direct the operations of the higher education institutions (HEIs) during the pandemic that opened doors to the exploration of viable and available learning modalities. This allowed HEIs to facilitate migration from traditional to flexible teaching and learning options which includes self-instructional modules. Accordingly, various measures by the higher education providers have been initiated to implement social isolation strategies, and online teaching is followed with rapid curriculum transformation.

The current situation in the HEIs ushers in new concepts and paradigm in the integration of new methodologies and new concepts in the teaching and learning. For instance, the practical courses curricula grounded on student-centered, spiral progression and performance-based learning, expect learners to be empowered through active involvement and participation even without face to face learning. In a more specific stance, the subjects related to food technology expects students to develop both the theoretical and practical skills.

With the use of online learning platforms, teaching and learning has introduced theoretical discussions. It also enabled the integration of teaching-learning process with the virtual methods of independent learning. With the absence of subscribed learning management system, teachers also used social media such as Facebook as well as the meeting applications such as Zoom, Google Meet and Microsoft Teams. According to Dania, Hatziharistos, Koutsouba & Tyrovola (2011), interactive multimedia is one of the most important applications of technology in computer assisted instruction. However, several researchers argue on the efficacy of online learning in the Philippines particularly on the subjects with practical applications and skills.

Several studies were conducted on the effectiveness of the current distance learning being implemented by the HEIs in the Philippines. According to Rotas and Cahapay (2020), identified several challenges faced by the students including unstable internet connectivity,

inadequate learning resources, electric power interruptions, vague learning contents, overloaded lesson activities, limited teacher scaffolds, poor peer communication, conflict with home responsibilities and poor learning environment. Similar findings were identified by Barot et al. (2021) who also highlighted that the online learning challenges of college students varied in terms of type and extent. Their greatest challenge was linked to their learning environment at home, while their least challenge was technological literacy and competency. These had impact on the quality of the learning experience and students' mental health.

In the context of food service management, the distance learning modality posed challenges on the development of students' skills on various practical topics. In this field, equipping students with the necessary practical skills essential for lifelong learning and work placement is immensely required. As required for the job, students in the food and service industry should be able to learn and upgrade their competency from time to time. To address this, several studies have emerged on the concept of self-directed learning. To help learners persistently improve skills, implementation of appropriate teaching strategies and activities has paramount importance. Several studies have indicated different teaching strategies and activities that motivate students toward self-directed learning (Gade & Chari, 2013; Janotha, 2015; Savin-Baden & Major, 2004). With hybrid curriculum that combines traditional teaching methods and innovative learning strategy, the students have greater tendency to become independent learners. There are limited studies addressing the effectiveness of the self-directed learning as applied in practical subjects such as food and service management.

One of the biggest challenges faced by the educators face today is theoretical and skills development of the students in the distance learning. While the students are not under the primary guidance of their teachers, they still need to develop the skills needed for their course. While it is crucial to close the gap between what is taught to students and what the industry expects of the students being hired (Dopson & Tas, 2004), the teachers are more concerned with the development of learning materials that are applicable to distance learning. The learning materials should not only address the knowledge requirement for the module but the skills development as well. For example, in the food service management subject the students are required to master both the theoretical and practical skills as the subject includes lecture and laboratory components. For this knowledge and skills are both important.

According to Tapia (2018), there are four types of knowledge that include (1) factual knowledge, (2) conceptual knowledge, (3) procedural knowledge, and (4) metacognitive

knowledge. The factual knowledge refers to the terminologies, specific details, and basic elements within any domain whereas the conceptual knowledge emphasized the interrelationships and/or functions among the details and elements that make up a larger structure (Hallett, Nunes, Bryant, & Thrope, 2012). Meanwhile, procedural knowledge refers to subject-specific skills, subject-specific techniques and methods, and criteria for deciding when to use the right procedures (Rittle-Johnson & Schneider, 2015). The metacognitive knowledge, on the other hand, refers to strategic knowledge and self-knowledge. These four types of knowledge are expected from the students taking food and service management. As the subject requires higher-order thinking skills, it both develops the theory and skills of the students.

According to Torrefranca (2017), the modular instruction of learning allows the student to achieve mastery on the content of the lesson. Moreover, the remote learning through modular approach is timely and relevant in providing quality education amidst the pandemic. This modular approach is appropriate for remote learning set up because it has a self-directed learning activity and place the responsibility of learning on the students. Furthermore, Sadiq and Zamir (2014) asserted that modular teaching is more effective in learning process because students learn at their own pace. With the emergence of various strategies for self-directed learning (Torrefrance, 2017), the development of the four types of knowledge is specifically addressed in this type of module.

The current study fills the gap in the very limited studies on the use of self-directed learning modules in the teaching of food service management. This also addresses an effective strategy in the new normal of teaching amidst the COVID-19 pandemic. As an educator, the author firmly believes that the output of the study benefits not only the teachers during the pandemic but also the whole academic community even during the post-pandemic period. This answers questions on the possibility of integrating innovative learning materials in addressing academic concerns. The output of the study is the humble contribution of the author to the academe which honed her to be a professional educator.

2. Literature Review

Level of Knowledge

Society today is becoming more sophisticated and the learners increasingly becomes more self-reliant, self-confident, and self-disciplined to direct their own learning and there are various strategies developed for self-directed learning (Torrefrance, 2017). According to Smedley (2007), there are strategies to be considered the readiness of self-directed learning, to wit: creating a supportive learning environment; providing constructive feedback; encouraging self-assessment; using self- reflection; providing opportunities to engage in their own learning processes; and developing goal orientation values.

According to Krathwohl (2002) as cited by Tapia (2018) there are four types of knowledge that include (1) factual knowledge, (2) conceptual knowledge, (3) procedural knowledge, and (4) metacognitive knowledge. Boshoff (2014) mentions that the distinction between "know-that" and "know-how", which was made by the philosopher Gilbert Ryle (1971), highlights two types of knowledge in practice: knowing that something is the case and knowing how to do things. The two knowledge types go by different names in the scientific literature. "Know-that" is sometimes referred to as factual knowledge, propositional knowledge, theoretical knowledge, explicit knowledge or declarative knowledge. Similarly, a number of terms are used to refer to "know-how" or aspects thereof, including procedural knowledge, practical knowledge, implicit knowledge, experiential knowledge and tacit abilities and skills.

Factual Knowledge. According to Tapia (2018), factual knowledge simply refers to the terminologies, specific details, and basic elements within any domain. This is the information that can and must be learned through exposure, repetition, and commitment to memory. It is a common knowledge that to be successful in meeting a goal, students need to know the related "facts". As to Hew and Cheung (2014), factual knowledge is one of the most common types of knowledge that students are expected to learn. Factual knowledge may be described as the basic information about a particular subject or discipline that students must be acquainted with. This may include the terminology and the specific details or elements of a subject (Anderson & Krathwohl, 2001). Acquiring factual knowledge is important to students because it serves as basic building blocks to understand the larger relationships among important information that define a subject.

The conventional conception of factual knowledge is that it is justified, true belief. Factual knowledge is normally expressed as a proposition, or is able to be expressed as a proposition, even if the knowledge is never vocalized but only passes through the head as a

statement. Moreover, factual knowledge is "formal, explicit, derived from research and scholarship and concerned with generalizability" (Rycroft-Malone, 2004) meaning that the propositions have been empirically derived through systematic observation and experimentation (O'Brien, 2006). Scientific evidence, therefore, can justify a belief as a factual claim, because the evidence is empirical, replicable, verifiable and public. However, science is accumulative as new knowledge is constantly generated that supports, contests or even supersedes existing knowledge; scientific theories also shift within larger paradigms.

The study of Varga and Bauer (2017) investigated the retention of new factual knowledge derived through integration of information acquired across temporally distributed learning episodes. Young adults were exposed to novel facts as they read long lists of seemingly unrelated information, one sentence at a time. They then were presented open-ended questions, the answers to which could be self-derived through integration of pairs of facts from the list. The results showed that newly derived knowledge remained accessible after a 1-week delay. Striking individual differences were also observed, which were related to whether individuals spontaneously identified the relational structure of the learning task. Insight into the relation between explicit task knowledge and strategic processing was also revealed through examination of response speed at the time of test. Specifically, knowledge of the task structure was associated with response latencies on unsuccessful (but not successful) trials, such that participants who were aware of the opportunity to integrate spent longer when they were subsequently unsuccessful, presumably reflecting directed search strategies and heightened perseverance when those processes failed. Together, the present findings provide direct evidence for the role of memory integration in the long-term accumulation of a semantic knowledge base and have theoretical implications for our understanding of this fundamental form of learning.

Conceptual Knowledge. Related to factual knowledge, conceptual knowledge can be understood as knowing the interrelationships and/or functions among the details and elements that make up a larger structure (Tapia, 2018). This definition includes (1) knowing information classification and categorization, (2) knowing principles and generalizations, and (3) knowing theories, models, and structures. Basically, conceptual knowledge is knowing that facts can be organized in meaningful ways.

According to Westwood (2008) a concept can be defined as "a mental representation that embodies all the essential features of an object, a situation, or an idea. Concepts enable to

classify phenomena as belonging, or not belonging, together in certain categories". Chinn (2012) defined concepts as characteristics that determine either the inclusion or the exclusion of something from a set or class. The focus is on classifying, categorizing, ordering and on labelling. Concepts, according to Rittle-Johnson and Koedinger (2009), are ideas that are generalized from specific instances and that govern a domain. It becomes conceptual once that knowledge is linked to other knowledge, such as the grouping of objects by ten and the multiplicative nature of each of the places.

Conceptual knowledge (notably characterised by Skemp, 1978, as Relational Knowledge) may be visualized as a connecting web of relationships (Miller & Hudson, 2007; Rittle-Johnson & Schneider, 2015). This connection can be between two previously learned mathematical ideas or concepts, or be a connection between a concept previously learned and a concept newly learned; "the principles which govern a domain" (Rittle-Johnson, Fyfe, & Loehr, 2016). Rittle-Johnson and Schneider (2015) have characterized it as being knowledge, where the rich links and relationships are as equally vital as the separate bits of information they join. However, Baroody, Feil, and Johnson (2007) asserted that when defining conceptual knowledge as being knowledge about facts, principles and generalizations, there is no necessity for the knowledge to be richly related. Rather, the research of Baroody, Feil, and Johnson (2007) and others (e.g. diSessa, Gillespie, & Easterly, 2004; Schneider & Stern, 2009) advocates that the conceptual knowledge of novices can often be disjointed, and can require time to become integrated, and that the richness of the connections increases with developing expertise. Scrutiny of Baroody, Feil, and Johnson's (2007) claim may lead to proposing a position with regards to the type of knowledge, conceptual or procedural, and also of the qualities of each type.

Richland, Stigler and Holyoak (2012) characterized conceptual knowledge as the attainment of expert facility of the conceptual structure of a domain. Clark (2011) saw concepts as the most powerful and useful cognitive tools available to people, as concepts have the 'capacity' of organization and association. In essence a concept is an idea that is well enough understood to allow other ideas to be connected with it and become part of a web of understanding. Such connections and webs often lead to the formation of conceptual knowledge.

According to Moser and Chen (2016), conceptual understanding can help students take what they learn in class and apply it across domains. While teaching to the test is common for

state accountability and measurement, these methods don't always arm students with the skills to complete tasks outside of the classroom. When people perform in a workplace, they often act based on previous knowledge, assumptions and understandings they have about a particular situation. They intelligently make decisions on what to do, and this often has to be done in an exploratory, innovative way, especially if it's a novel situation. More often than not, people won't have all the necessary information they need to explicitly be told how to make the correct decision. This is where developing conceptual understanding and associations comes in. If students aren't given the chance to experience this type of exploratory learning as young learners, they will lack the appropriate skills to develop situations to everyday problems. Teacher can teach students all the information they need, but if they're not building on, analyzing, evaluating or having the chance to be creative with this knowledge in a relevant way and making associations, they won't develop the ability to deeply understand and transfer knowledge to make educated assumptions about new situations. When information isn't available, people need to use the conceptual understandings and associations they've formed about similar concepts to successfully execute decisions.

Procedural Knowledge. According to Tapia (2018), this knowledge type is critical for success in goal attainment because it puts the "what" into action through the "how" process. Procedural knowledge can be understood as knowledge of (1) subject-specific skills and algorithms, (2) subject-specific techniques and methods, and (3) criteria for deciding when to use the right procedures.

Procedural knowledge refers to skills and abilities that are demonstrated in practice through the performance of procedures, without the performer necessarily being able to articulate what is being done (Boshoff, 2014). The emphasis is on "necessarily" because in some cases a skilful performer may also be able to describe the procedure. Procedural knowledge does not always remain implicit and without conscious awareness. Thagard (2006) illustrates this point with reference to three hypothetical cases about the know-how involved in scientific collaboration. The first is where the know-how is explicit from the start and a verbal rule has already been articulated. In the second case, there is no verbal rule in place but a rule can potentially be extracted from the procedural knowledge exhibited. Lastly, there are instances where procedural knowledge is inherently implicit and impossible to translate into verbal rules, for instance in the case of a novice who does not have: any conscious awareness

or memory of the physical, intellectual, or social behaviours of the experienced collaborator but nevertheless encodes and eventually duplicates them.

Procedures are a series of steps and/or actions employed to achieve a task or reach a goal (Rittle-Johnson, 2017; Rittle-Johnson, Schneider, & Star, 2015). Adopting this definition, could lead to what Skemp (1978) referred to as learning "rules without reason". Martin (2009) warned that executing procedures in such a mechanical fashion which employs rules without reason can often lead to peculiar and unreasonable solutions. In essence a procedure is a routine, but it can be either thoughtfully considered, or executed with little consideration. Procedural knowledge is characterized by some researchers (Canobi, 2009; Miller & Hudson, 2007; Rittle-Johnson & Schneider, 2015) as the capacity to follow steps in sequence to solve problems or reach a goal. This can comprise a familiarity with, and a knowledge of, the system to construct, but can also pertain to a knowledge of procedural rules necessary to solve problems (Hiebert, & LeFevre, 1986; Rittle-Johnson & Schneider, 2015). Baroody, Feil, and Johnson (2007) observed that procedures can often be interconnected or embedded within other procedures, and disagree with teachers who may view procedural knowledge to be devoid of relationships. Again, it appears prudent to reflect on the qualities of procedural knowledge, rather than to just accept a shallow, ill-considered, and perhaps sometimes unconsidered characterization of this type of knowledge.

The term procedural knowledge is used to describe knowledge of operations in the sense of a sequence of steps or partial actions, which are performed to achieve a specific goal (Baroody, 2003; Hiebert & Lefevre, 1986; Rittle-Johnson & Schneider, 2015; Rittle-Johnsonet al., 2001; Star, 2007). Process approaches, in contrast to pure product approaches, have been proven to be effective instructional strategies to foster the application of conceptual knowledge. Despite the promising approaches, there is still a lack of knowledge about why students struggle to apply the acquired knowledge. One explanation could be that the content alone is not sufficient for successful application but needs to be structured or organized (Schmidmaier et al., 2013).

Procedural knowledge about frameworks, such as systems thinking and design thinking, can help students develop thought patterns and structured processes that can enable them to identify and solve problems. Some procedural knowledge is domain-specific while other kinds of procedural knowledge are transferrable across different domains. Mobus (2018) defines systems thinking for the classroom as "being able to see how the systems are organized

for purposes and how, if they fail to serve those purposes, they will not be able to persist as systems". Mobus believes that when students learn systems thinking, they can transfer the disciplinary knowledge of what a system is and the procedural knowledge of how a system works, to recognize and understand the ill-defined systems of the real world (Benander, 2018). While it embraces a holistic view of the problem, it concentrates on specific perspectives (Benander, 2018). Goldman (2017) describes design thinking as "a process, a set of skills and mindsets that help people solve problems through novel solutions. The aim is to move beyond simply teaching the steps of the process and providing students with experiences, such as empathy development, participation in 'team collaborations', commitment to action-oriented problem solving, a sense of efficacy, and understanding that failure and persistence to try again after failure is a necessary and productive aspect of success". Design thinking is concerned with the methods used to solve a problem; whether the solution actually works; what the potential users of the solution need; the contemporary social and cultural appropriateness of the solution; and the aesthetic appeal of the solution (Pourdehnad, Wexler and Wilson, 2011). Procedural and disciplinary knowledge function together to create a mutually informed understanding of novel contexts. A challenge for education is to help students develop deeper understanding by facilitating both disciplinary and procedural knowledge, and connecting them with the skills, attitudes and ability to transfer knowledge (Benander, 2018).

Numerous definitions and models of metacognition exist in the literature (Gascoine, Higgins, & Wall, 2017; Panadero, 2017). For example, cognitive psychologists often define and study metacognition in the context of executive functions. The executive functions play an important role in promoting metacognition in learning, including the ability to sustain attention and switch focus from one task to another (cognitive flexibility), the ability to retain and recall information (working memory), and the ability to recognize and control impulses that distract from the learning process (inhibitory control; Center on the Developing Child, 2020; Howard & Vasseleu, 2020).

Metacognition as such can be understood as the specific potential and capability to operate one's own thinking as an object; this includes the following two basic components: (i) The stable part ("off-line") covering metacognitive knowledge; (ii) metacognitive regulation referring to the processes of activities ("on-line") involving necessary capabilities and active aspects such as prediction, planning, monitoring, and evaluation of the conducted cognitive activities (Azevedo, 2009). Even though the metacognitive development cannot be considered

from the linear view solely, on the other hand, metacognitive knowledge as such is gradually and conceptually built up earlier than the required metacognitive regulation as such. Hence, metacognitive knowledge refers to the actual individuals' extent of knowledge of their cognitive strengths and weaknesses. The relevant field includes the given learner's knowledge of outer and inner factors that might influence and enhance any cognitive processes, and the knowledge of relatively efficient use of accessible strategies and methods. In this way, their own convictions can be included, whether true or not, among this information.

In education, metacognition is most often studied in the context of self-regulated learning, a common skill among high achieving students (Karlen, 2016). When applied to the learning process, self-regulation entails developing a plan to achieve a task-specific goal, monitoring and controlling one's ongoing performance, and self-reflection (Panadero, 2017). Self-regulated learning is an overarching construct that takes into consideration the influence of environmental factors and is comprised of several psychological concepts, such as motivation, emotion, and metacognition. Metacognition—broadly defined as purposeful thinking about thinking—has been described as "the gateway to self-regulating one's learning" (Winne & Perry, 2000). During the self-regulated learning process, metacognitive learners select a task-specific goal that their prior experience suggests is appropriate and realistic. While working on a task, metacognitive learners select from an array of learning strategies based on the applicability to the task, their strengths and weaknesses, and relevant past experiences. The emotional knowledge and regulation skills they bring to the learning task support their use of metacognition and the academic resilience to persist through setbacks. Finally, during the self-reflection phase, metacognitive learners determine whether they achieved their goal and attained greater conceptual understanding of the material. They compare their product to a set of standards and their own past performances and evaluate their use of learning strategies. They also evaluate how well their strategies worked and their emotional experience across the learning process. As this process unfolds across different settings, metacognitive skills become habituated (Beach et al., 2020).

Researchers commonly describe three types of metacognitive knowledge: declarative, procedural, and conditional (Schraw, Crippen, & Hartley, 2006). Declarative knowledge refers to students' knowledge of themselves as learners and what factors are likely to influence their learning. Procedural knowledge focuses on students' understanding of various learning strategies, such as note-taking methods and reading comprehension techniques. Conditional

knowledge is necessary for students to know when and why to use certain learning strategies based on the demands of specific tasks, the characteristics of the broader learning environment, and their own strengths and weaknesses.

Metacognitive skills or skillfulness refers to the capacity to actively monitor and control one's own thinking and behavior using specific learning strategies such as goal setting, progress monitoring, and deliberate reflection. Metacognitive skills are closely related to executive functioning (Roebers, 2017). Executive functions are self-regulatory processes that help facilitate metacognition. For example, students need executive functions, such as impulse control, to avoid reverting to a learning strategy that they metacognitively know will not work based on past experiences (Roebers, 2017). Finally, students need consistent access to metacognitive experiences—explicit learning opportunities that activate metacognitive knowledge and require use of metacognitive skills. Metacognitive experiences include everything from formal classroom tasks and reflections to informal opportunities to learn at home or during extracurricular activities.

Several meta-analyses have found a positive link between metacognition and students' academic performance (Dignath, Buettner, & Langfeldt, 2008; Donker et al., 2014; Hattie, 2009; Ohtani & Hisasaka, 2018). Hattie's (2009) synthesis of more than 800 meta-analyses focused on factors predicting academic achievement, which found teaching metacognitive strategies as one of the top ten most influential factors in student learning and success. A more recent meta-analysis found metacognition predicts academic performance from primary school students through adults, in both classroom and laboratory settings, and when controlling for intelligence (Ohtani & Hisasaka, 2018). Interventions designed to increase academic performance by improving metacognitive knowledge and skills have been consistently effective. In a meta-analysis of various learning strategy interventions, those that included a focus on developing students' metacognitive knowledge by teaching "which strategies to use and how to apply them (declarative knowledge) but also when and why to use them (procedural and conditional knowledge)" had the strongest effects on students' writing, science, math, and reading performance (Donker et al., 2014). That effect held across different groups of students (e.g., students from socioeconomic challenged backgrounds, students with learning disabilities, and gifted children) and developmental periods (Donker et al., 2014). Interventions that combine instruction on metacognitive knowledge and strategies (Dignath et al., 2008) and those aimed at enhancing students' motivation by addressing task value seem to be most

effective (Donker et al., 2014). Even interventions where metacognition is not the focal point also showed positive effects. The insights a student acquires from a metacognitive experience are then applied to the next cognitive task (Panadero, 2017). Students typically use general and domain-specific metacognitive knowledge and skills to complete cognitive tasks. Domain-specific metacognitive knowledge and skills are necessary for near transfer (e.g., different tasks within the same domain) whereas general metacognitive knowledge and skills are needed for far transfer (Conley, 2014). Research suggests students need both general and domain-specific metacognitive knowledge and skills to be successful academically and that transferring metacognitive skills across domains is possible, but limited (Neuenhaus, Artelt, Lingel, & Schneider, 2011).

There are several studies conducted that proved the impact of cognitive and meta-cognitive on the students' performance. Baker, Basaraba and Polanco (2016) found that it helped students perform better in reading skills, Ciechanowski (2014) reported that students increased in both language proficiency and content knowledge, Martinez-Alvarez, Bannan, and Peters-Burton (2012) found that students increased in reading proficiency but not in content knowledge and Zohar and Barzilai (2013) found that it has positive effects on problem-solving and reading. In fact, teaching approaches that place emphasis on students' metacognitive and self-regulated learning are credited as the most effective approaches for enhancing pedagogical practices (Hattie, 2008; Tay et al., 2020). In the application of metacognition, Price-Mitchell (2015) suggested 7 powerful strategies that include: (1) teach students how their brains are wired for growth; (2) give students practice recognizing what they don't understand; (3) provide opportunities to reflect on coursework; (4) have students keep learning journals; (5) use a "wrapper" to increase students' monitoring skills; (6) consider essay vs. multiple-choice exams and (7) facilitate reflexive thinking.

Self-directed learning modules

Society today is becoming more sophisticated and the learners increasingly becomes more self-reliant, self-confident, and self-disciplined to direct their own learning and there are various strategies developed for self-directed learning (Torrefrance, 2017). Moreover, Jayasree (2004) discussed that another way of individual instructions is the self-learning modules. Macarandang (2009) explained that the use of modules as a learning material is no longer new in the field of education especially in the tertiary level, this teaching-learning material is

characterized by small-step, sequential and concept-and/or skill-oriented presentation of a unit of learning. This applies to all levels of learning, and to a wide range of learning activities: in school, in the trade and industry and even in the world of high technology. As an instructional strategy, modules are designed to bring about a satisfactory level kind of learning among slow, average and fast learners.

The informal learning resources and tools are proliferating online (Bonk, 2009; Cross, 2007). As a consequence of this age of information abundance, there is greater emphasis on self-directed learning and learners assuming more control over their learning activities (Brookfield, 2013; Sze-Yeng & Hussian 2010); especially in online environments (Song & Hill, 2007). This trend is pervasive across all age levels and occupations. For instance, some young people are skipping K-12 school settings and instead studying from OER (Al Haddad, 2011). Other youth who lack decent textbooks or have limited access to quality teachers are learning from free and open videos provided by the Khan Academy (Chandrasekaran, 2012). At the same time, some adolescents are learning multiple languages through free online video and text resources (Leland, 2012).

Self-directed learning (SDL) is a process in which individuals take the initiative, with or without the help from others, in diagnosing their learning needs, formulating goals, identifying human and material resources, choosing and implementing appropriate learning strategies, and evaluating learning outcomes (Knowles 1975). Self-direction skill (SDS) is considered as a necessary skill for learners in the framework for twenty-first-century learning (P21-Framework 2009). For supporting the acquisition of SDS, questionnaire-based reflective practices are a common method that scholars apply (Williamson, 2007; Stockdale & Brockett, 2011). For this process to be implemented in the classroom setting, human tutors can also facilitate (Walker and Lofton 2003). Overall, SDL has various meta-cognitive aspects that are supported by reflective evaluation of the learners' ability.

A self-directed activity for students could happen not only in the learning context, but also in their daily physical activity context. The current e-learning tools and wearable devices make tracking and logging both learning behaviors and physical activities more affordable, respectively. Many recent researches have shown great opportunities for applying multiple data sources in learning analytics (LA), such as arm tracking (Andrade 2017), step counts (Di Mitri et al. 2017), heart rate (Spann et al. 2017). Another method is the DAPER (Data

Collection–Data Analyze–Setting Goal and Plan–Execution and Monitoring–Reflect), a model of data-driven SDS execution and acquisition (Majumdar et al. 2018).

Self-directed learning is clearly a multifaceted concept that should not be approached through one perspective. According to Kerka (1994), the biggest misconception may be in trying to capture the essence of self-directed learning in a single definition. Van der Walt (2019) also points to the terminological confusion regarding this concept, which has led to communication difficulties about the subject of self-directed learning. Van der Walt concludes that researchers in the field of self-directed learning have two options. One is to continue the terminological confusion by defining their understanding of the concept, or, as a second option, they can depart their research from the original definition of self-directed learning provided by Knowles and his colleagues (2019, p. 16). In the following, some notions of the self-directed learning concept are accounted for. It entails individuals taking initiative and responsibility for their own learning which can take place both inside and outside of formal educational institutions. When teachers are involved, they should be facilitators of learning, not transmitters.

Learning independently can be challenging, even for the brightest and most motivated students. As a means of better understanding the processes involved in this mode of study, the University of Waterloo (n.d.) suggests the four key stages to self-directed learning: being ready to learn, setting learning goals, engaging in the learning process, and evaluating learning. The first step involves students conducting a self-evaluation of their current situation, study habits, family situation, and support network both at school and at home and also involves evaluating past experiences with independent learning. Next, the communication of learning goals between a student and the advising instructor is critical. Students need to understand themselves as learners in order to understand their needs as self-directed learning students. Finally, modular approach is very useful method for the students to learn. Therefore, using modules is advantageous in classroom or even remote learning approach.

According to Smedley (2007), there are strategies to be considered the readiness of self-directed learning, to wit: creating a supportive learning environment; providing constructive feedback; encouraging self-assessment; using self- reflection; providing opportunities to engage in their own learning processes; and developing goal orientation values. Moreover, Shaikh (2013) argued that self-directed learning exists and present in each

learner to some degree, however, the student's readiness for self-directed learning differs from one another.

According to Perry, Phillips, & Hutchinson (2006), in order for the learners to achieve academic success, the learners practice good learning habit, develop a deep understanding of the learning resource, take challenging tasks, and put extra effort to learn new concept. However, in order for the learners to be prepared in a world that is marked by rapid changes education needs to achieve two objectives: (1) to provide the appropriate content knowledge; and (2) to prepare learners with SDL skills that will serve them throughout their lifetime (Dynan, Cate, & Rhee, 2008).

The importance of self-directed learning (SDL) has been noted for decades. Research from Deci and Ryan (2008) revealed the need for learning tasks to be personally meaningful, interesting, enjoyable, and embedded with a sense of control or personal autonomy. The more that learners can freely and openly explore learning experiences, the greater the chance that they will exhibit their creativity and participate in productive ways in the world at large (Bonk & Lee, 2017). Similarly, Ramos et al. (2021) found that the level of academic achievement before using the SLM in Economics was very 'Satisfactory' and 'Outstanding' after the utilization of SLM, hence the SLM was very useful and effective in the teaching of economics in the public secondary schools in Zambales, Philippines. In the study of Agrawal et al. (2019) found that majority of the students (84%) have found SDL as a more interesting and enthusiastic way of learning. Majority of students found SDL an enjoyable form of learning that gives ample opportunity to interact with the faculty. In addition, Kidane et al. (2020) found in their study that a significant increase in SDL score on comparing students at year-1 with students at year-2 ($p = 0.002$). Both year-1 and 2 students rated PBL tutorial discussion and tutors had high influence on their individual learning; whereas, other curricular components such as lectures and tests had low influence on their SDL ability.

The self-paced learning material will help learners to thrive and survive in the new normal state. Furthermore, a method to self-directed learning requires the utilization of instructional materials that are designed to encourage the students to learn at their own pace. These self-instructional materials, which could be in module form, includes a self -contained, independent unit of instruction prepared for the purpose of attaining defined instructional objectives (Macarandang, 2009). It was further explained that two distinctive features of self-instructional modules promote self-paced learning and its availability at any time and at any

place. It allows a learner to work at his/her own pace rather than the pace of the group, which can be too fast or too slow. The availability of the self- instructional material likewise allows students to learn when they wish rather than according to an external timeline.

A wide range of practical strategies and policies may be employed to facilitate the development of intrinsically motivated, self-directed learning. Self-directed learners should be given opportunities to teach others, thereby reinforcing their own knowledge and understanding. Group work assignments provide students with opportunities to share and to explain what they have learned to others, thereby reinforcing their own understanding of subject matter and confidence in their own abilities (Douglas & Morris, 2014). Collaborative learning tasks enhance self-directed learning. Interactive online environments provide valuable opportunities for a variety of collaborative learning projects (Bryan, 2015). Collaboration with peers can foster self-directed learning and increase the intrinsic motivation to learn. Blogs are one form of effective, interactive, technology-based communication that can be used to create a collaborative community of learning and to promote highly reflective learning and self-assessment (Robertson, 2011). The sharing of personal experience provides numerous opportunities for self-reflection. Personalizing learning tasks may assist learners in encoding new knowledge within existing cognitive frameworks (Butcher & Sumner, 2011). Social interaction can provide a catalyst for intrinsic motivation and deep, reflective learning. Self-directed research involving the use of social media can promote the development and improvement of complex knowledge management skills and of self-monitoring, self-assessment, and goal selection (Rampai, 2015). Effective self-directed learning requires some degree of control of the selection of learning goals. The manner in which students learn and the acquisition of independent study skills are as important as the subject matter and facts being learned. Self-directed learners are competent at teaching others what they know (Kalantzis, 2003). Curricula need to address a wide range of different learner backgrounds and life experiences. The life experiences of learners can be used as a useful and motivating learning resource in independent learning (La Porte, 2015). Strategies to enhance self-directed learning should be learner-centered, community-based, and relevant to the personal and professional needs of lifelong learners.

Loyens et al. (2008) pointed out that analysis is the starting point of SDL. They stated that analysis in the practice of SDL is to determine the task (e.g., what is the task about?) and personal features relevant for the task (e.g., what knowledge can I apply? Do I find the task

interesting?). According to Thornton (2010)'s four phases of a self-directed learning cycle, analyzing task needs and current skill is in the planning phase. Noguchi and Mccarthy (2010) stated that analytical skill is the ability to examine what happened in their learning process in detail and discern the cause and effect relationship among various elements involved in the process. Previous literature converges to the understanding that analysis skill is to identify issues in self-directed activities with respect to one's own learning personalities. In our research, we support students to analyze their own status by using the data synchronized and affordances designed in the system.

Food Service Management

Food safety has been an increasingly important public health issue for years (Bloomfield et al., 2016). 420,000 people die every year and that is almost 1 in every 10 people in the world to suffer a sickness after consuming contaminated or unsafe food as per to the World Health Organization (WHO, 2016). Foodborne illness has a tendency to increase in two categories of income which is middle and low- income nations because of the surge in consuming unsafe foods specifically fresh produce product, fish product and farm animals (Uyttendaele et al., 2015). Consumption of unhealthy food is becoming more severe and there are increasing cases on the matter and it does not only imply to the general public, but there is concern, issue arises among school children despite many efforts that have been done by the authorities (Norazmir et al., 2012). Probably, the importance of knowledge on food safety is still not well-known to many (Norazmir et al., 2012).

Every single person is at risk of experiencing foodborne disease, but the only difference is in terms of the risk level (Norazmir et al., 2012). The people with low level of knowledge about food safety are likely to suffer with any food illnesses ever existed (Norazmir et al., 2012). Food safety systems that are highly developed like in Europe "farm-to-fork" and in the United States of America "farm-to-table", at least dependable group of people still can cause significant rate of disease and even death in a population from foodborne disease (Norazmir et al., 2012; Boyce et al., 2008). The second packaged food left the manufactured establishment and being distributed, consumers have to rely on their own levels of knowledge and the most trustworthy on the packaging to avoid from eating the unsafe food product even if the food service personnel do practice a proper food safety (Boyce et al., 2008). It was reported in

various studies that consumers aged18-29 years have a poor food handling practices even with an education above high school level compared with others (Ali et al., 2019).

It is important to evaluate the student's level of knowledge, which will determine their perception and subsequently transform into their behavior. Majority of food handlers do not have a proper background education on regulations of food safety and hygiene but still have been brought into the industry as food handlers (Ali et al., 2019). Cheng et al. (2017) stated that in recent studies done in Beijing, approximately 75% of the student population eat food served by an individual who was unlicensed once a week, which is normally very delicious but may have a safety problem. Developing a proper attitude, sound knowledge and skills to understand current food issues is without a doubt by providing education towards food safety for the young generations (Cheng et al., 2017). Lazou et al. (2012) found that university students have an imperfect knowledge and usually partake in practices of food handling that is hazardous even students who come from courses related to food safety (Halim et al., 2016). An observation made by Odeyemi et al. (2019) found that effective food safety training on a regular basis must be compulsory and ongoing as it can eliminate the possibility of misleading towards food safety issues (Halim et al., 2016). Closing the gap discovered from other studies that involves on food safety matter is the responsibility of the young adult as the new generation of food handlers to decrease the extensiveness of foodborne illness (Halim et al., 2016). Minimizing the rate of foodborne illness breakout is by having a clear understanding of the relationship of overcoming the beliefs on knowledge and practices towards food safety (WHO, 2014). Despite the statistics on the increase rate in foodborne illness, consumers convinced that they do possess sufficient comprehension towards sanitary practices of food handling (Ovca et al., 2014). Food personnel were reported to be one of the most causes of foodborne disease due to lack of personal hygiene (Regan, et al., 2016). The increase in foodborne disease caused by few factors such as the inadequate training on food safety, proper education for food personnel, the change of habits in preparing food, heightening in establishments of food service and the rise of eating outside (Cruz, 2019).

There is a lack of studies that was executed to examine the knowledge and practices of food safety among food personnel or tertiary level students in countries that is already evolving (Van Lieshout & Dawson, 2016). Comparing the knowledge of consumers between the year 1993, 1998 and 2001, it was discovered that as the time passed by, knowledge on food safety will surely arise (Lazpoulos Friedman & Van Camp, 2016). Knowledge of food safety is very

important among students because they are also consumers (Turnbull-Fortune & Badrie, 2014). However, good knowledge is not a guarantee for exemplary implementation. Other studies found inconsistency in consumers' concern towards food safety in terms of knowledge and practices of the household (Gurudasani & Sheth, 2009). Evaluating information without good practices is a fragmented picture of customer mindfulness towards food safety as getting high detailed qualities does not show that the learning is being used at the ideal time. Using one's learning to shield one's self as well as other people from sanitation risks could easily compare to great information scores. Great learning with deficient implementation contemplates the absence of inclusion and significance that the matter of hygiene has on the customers (Y. A. Sayuti et al., 2020). Behavioral changes do not necessarily occur with sufficient amount of knowledge, along with various programs for hygiene education that failed to serve its purpose to create changes (Greyson, 2016).

Based on a study that was done in China, the college students there were very cautious with the state of their food safety and the food safety issues. Their knowledge on this matter is the average, which gives a cause for concern because more than half of them ends up purchasing unsafe food that could ultimately cost their health (Luo et al., 2018). In the field of food safety, it does not only relate to the people's health but also the stability of social standings and the undertaking of various developments (Teh et al., 2016). Teh et al. (2016) also stated that not enough food hygiene knowledge is a factor that lead to the existence of diarrhoea among university students. This can be a high possibility when students consume food that they prepare themselves at home. Ness (2017) said that female students do not have enough knowledge on preventive measures to foodborne illnesses and there is other research that shows the result of university students having compliance issues to proper food handling practices. There is a very limited amount of information regarding the practices of food safety amongst university students in Malaysia. The practice is highly determined by a person's knowledge and attitude. Ness (2017) explains that when a person has low food safety scores, it can indicate that the person has low awareness toward the essential part of proper implementation of food safety. A secondary excuse can be the lack of knowledge given to them during their time in secondary school, which shows how the current education system is not doing enough to teach the students regarding food safety knowledge, attitude and practices. Another research found that there is no connection between demographic characteristics and course of study in practicing an upright food safety aspect (Foong et al., 2018). According to

Lelieveld et al. (2016) there is a need to be a custom targeted risk communication and learning plan that will effectively influence the consumer's actions. However, there may not be any differences in encouraging behavior or practices if practice is only based on scientific communication.

3. Methodology

3.1 Research Design

This study is descriptive quantitative and experimental in nature. According to Nassaji (2015), descriptive design in which data is collected in a qualitative manner and analyzed using quantitative procedures. It intends to find out 'what' related to a phenomenon while Apuke (2017) describes quantitative research as a design that presents data in numeric form. The statistical data were collected by means of a questionnaire as a way of assessing a social phenomenon. Meanwhile, Barrett (2010) explains that in an experimental study (or an experiment), the researcher intervenes to control the values of the explanatory variables that are applied to the individuals. The researchers allocate treatments (i.e., apply the intervention). Since the current study aims to assess the use of the SLM in Food Service Management in two phases, the quantitative-descriptive and experimental methods are the most appropriate.

Research Respondents

The population of the study were the Bachelor of Technical Vocational Teacher Education students at Dalubhasaan ng Lungsod ng Lucena. Currently, there were 226 students enrolled in the course. The study considers the students enrolled in the subject Food Service Management. This is a major subject offered to the first, second and third year students of the course. The different areas of the subject include food preparation for the first year level, baking for the second year level and bartending for the third year level.

Through purposive sampling technique, the study takes the first and second year students of BTVTEd. The two year levels were chosen because of the total number of students enrolled in the subject, the areas contained in the subject and the convenience in the implementation of the module. Currently, there are 126 students in the first and second year levels. As the study involves evaluation of the module through an experimental research, complete enumeration will be used. Thus, all the students are included as sample.

Research Instruments

The two sets of instruments are the assessments and self-constructed questionnaire. Assessments. There are four types of tests which are incorporated in the SLM. The pretest comprises the first topic introduced by the teacher through online teaching without the aid of the SLM. Meanwhile, the posttest refers to the second topic introduced by the teacher with the aid of the SLM.

The different tests associated with the components in the SLM are the following:

Level of Knowledge	Component in the SLM
Factual knowledge	Self-check
Conceptual knowledge	Observation Results
Procedural knowledge	Activity Output
Metacognitive knowledge	Performance Criteria Checklist

Factual Knowledge. The test contains identification and/or multiple choice questions on the key terminologies of the topic. This evaluates the students' memory on the relevant terms in the discussion.

Conceptual Knowledge. The test refers to the teacher and/or facilitator's rating on the students' actual performance of a specific task. This evaluates the students' ability to conceptualize and recall the specific directions and/or guidelines in the preparation of a specific task.

Procedural Knowledge. The test refers to the students' actual performance of the required output through a video or vlog. This evaluates the ability of the student to demonstrate the process without guidance.

Metacognitive Knowledge. The test refers to the students' self-assessment through the performance criteria checklist. This evaluates the ability of the student to reflect on their actual performance.

Survey Tool. The survey tool contains the students' evaluation of the SLM. The survey tool is divided into three parts: general evaluation of the SLM in terms of clarity of instruction, objective set, accessibility and language used; specific evaluation of the SLM components which include learning objectives, learning content, self-assessment, task sheet, job sheet and performance criterial checklist; and the challenges faced by the students in using SLM.

Validation of the Questionnaire. The content of the instrument was checked and validated by three experts in the field: Master Teacher, Research Director and Teacher of Food Service Management. Any modifications suggested by the panel were incorporated before the data gathering proper.

Research Procedure

As per research protocol of the school, prior to the administration of the questionnaire, the researcher sought the approval of the Dean of Graduate Studies and Applied Research and the panel members of the thesis proposal. The data gathering was personally conducted by the researcher. Since the researcher teaches the subject, the questionnaire was retrieved instantly after the class.

The study was conducted during the actual classes of Food Service Management. The implementation of the study comprises two weeks with another week for the data tabulations. The first week of the class is allocated for the pretest without the use of the SLM. The teacher conducts the class normally through online and offline. The students are given the four tests within the week.

During the second week of the class, the teacher introduces the SLM. The students are given the copy of the SLM and instructs them to read and follow through the lectures and instructions. After the regular conduct of the class, the teacher tasks the students to perform all the tests included in the SLM.

During the third week of the class, the teacher evaluates the students' outputs through the rating scales provided in the SLM. The data gathered are tabulated for further statistical analysis.

Statistical Treatment of Data

The following statistical tools are used for the analysis of the data.

Frequency count and Percentage. This was used to answer statement of the problem number 1 and 4.

Weighted mean. This was used to research questions 2 and 3. It is calculated by multiplying the weight (or probability) associated with a particular event or outcome with its associated quantitative outcome and then summing all the products together.

Paired T-Test. This was used to answer research question 5.

Pearson R. This was used to answer the research question 6.

4. Findings and Discussion

Table 1. Pretest and Posttest Performance in the Food Service Management

Food Service Management	Pretest Performance		Posttest Performance		Verbal Interpretation
	f	%	f	%	
Factual Knowledge					
90-100	-	-	8	25.0	Very Knowledgeable
85-89	1	3.1	18	56.3	Knowledgeable
80-84	8	25.0	6	18.8	Fairly Knowledgeable
75-79	15	46.9	-	-	Less Knowledgeable
Below 75	8	25.0	-	-	Not Knowledgeable
TOTAL	32	100.0	32	100.0	
Conceptual Knowledge					
90-100	-	-	9	28.1	Very Knowledgeable
85-89	6	18.8	22	68.8	Knowledgeable
80-84	14	43.8	1	3.1	Fairly Knowledgeable
75-79	12	37.5	-	-	Less Knowledgeable
Below 75	-	-	-	-	Not Knowledgeable
TOTAL	32	100.0	32	100.0	
Procedural Knowledge					
90-100	1	3.1	12	37.5	Very Knowledgeable
85-89	27	84.4	20	62.5	Knowledgeable
80-84	4	12.5	-	-	Fairly Knowledgeable
75-79	-	-	-	-	Less Knowledgeable
Below 75	-	-	-	-	Not Knowledgeable
TOTAL	32	100.0	32	100.0	
Metacognitive Knowledge					
90-100	5	15.6	19	59.4	Very Knowledgeable
85-89	21	65.6	13	40.6	Knowledgeable
80-84	6	18.8	-	-	Fairly Knowledgeable
75-79	-	-	-	-	Less Knowledgeable
Below 75	-	-	-	-	Not Knowledgeable
TOTAL	32	100.0	32	100.0	

Table 1 shows the results of the pre-test and post-test of the food service management students. The scores obtained from the two tests determine the level of performance in terms of the factual, conceptual, procedural and meta-cognitive knowledge. The overall results show that students obtain higher ratings in the post-test than the pre-tests in all the indicators tested. The empirical evidence indicates all students obtained upper scores ranges of 85-100 in the

post-tests. According to Norazmir et al. (2012), the people with low level of knowledge about food safety are likely to suffer with any food illnesses ever existed. As such, the low level of knowledge of the students during the pre-test highly improved after the use of the self-directed learning material. This entails the ability of the students to master the food safety process and procedures. It is important to evaluate the student's level of knowledge, which will determine their perception and subsequently transform into their behavior.

The test of the factual knowledge resulted to higher post-test scores that the pre-tests as indicated by the 25% students in the 90-100 (Very Knowledgeable) and 56.3% of the students in the 85-89 scores (Knowledgeable). The 18.8% of the students are fairly knowledgeable with scores of 80-84. These scores are extremely higher than the pre-test scores where majority of the students are less knowledgeable (46.9%) with test scores of 75-79 and not knowledgeable (25.0%) with scores of below 75. Only 25% of the students have scores of 80-84 or fairly knowledgeable and 3% of them are knowledgeable with scores of 85-89. Factual knowledge simply refers to the terminologies, specific details, and basic elements within any domain (Tapia, 2018; Hew & Cheung, 2014). In this particular subject, the common terminologies tested were antipasto, appetizers, tapas, cured meat, hors d'oeuvres, garde manger, kitchen brigade, canapé, garnish and spreads, gazpacho, cocktail dishes, skewed and toppings among others. The results imply that the ability of the students to define and use the different terminologies in food service management had improved dramatically from pre-test to post-test after their exposure to the self-directed learning module as supported by the increase in the number of students in the knowledgeable and very knowledgeable levels from 3.1% to 81.3%. This is similar to the results of Varga and Bauer (2017) that newly derived knowledge remained accessible after a 1-week delay.

Meanwhile, the test of the conceptual knowledge also shows higher level of performance in the post-test than the pre-test. This is indicated by 28.1% of the students with scores of 90-100 or very knowledgeable and 68.8% of them with scores of 85-89 or knowledgeable. Only 3.1% of the students scored 80-84 or fairly knowledgeable. These scores are comparatively higher than the pre-test scores, which are mostly less knowledgeable (37.5%) with scores of 75-79 and fairly knowledgeable (43.8%) with scores of 80-84. There were only 18.8% of the students who scored 85-89 and obtained knowledgeable level. According to Tapia (2018), conceptual knowledge can be understood as knowing the interrelationships and/or functions among the details and elements that make up a larger

structure which includes knowing information classification and categorization, knowing principles and generalizations, and knowing theories, models, and structures. As the food service management requires students to be organized in terms of the various components of food handling and other services, the results clearly indicate an improved knowledge on the abilities of the students to organize and classify theories related to the subject. As Moser and Chen (2016) asserted that conceptual understanding can help students take what they learn in class and apply it across domains, the results expect that students were able to apply whatever students learned from the self-directed learning module.

On the other hand, the test of the procedural knowledge similarly indicates higher scores in the post-test than the pre-tests. The majority of the students at 62.5% scored 85-89 equivalent to knowledgeable while the rest at 37.5% scored 90-100 equivalent to very knowledgeable. Meanwhile, the pre-test scores showed majority of the students at 84.4% were knowledgeable with 85-89 test scores. There were 3.1% of the students in 90-100 range or very knowledgeable and 12.5% in 80-84 range or fairly knowledgeable. During the pre-test, the students were not able to follow proper procedures on the performance of their tasks on food handling and preparations. However, the post-test showed great improvements on their abilities to follow the proper process of food handling and preparations. According to Boshoff (2014), this knowledge emphasizes on skills and abilities that are demonstrated in practice through the performance of procedures, without the performer necessarily being able to articulate what is being done. This includes subject-specific skills and algorithms, subject-specific techniques and methods, and criteria for deciding when to use the right procedures. As such, the results indicate that students improved their knowledge on their actual performance of tasks.

The metacognitive knowledge indicates higher scores in the post-test than the pre-test. In the post-test, majority of the students are knowledgeable (40.6%) and very knowledgeable (59.4%) with scores from 85 to 100. Meanwhile, the pre-test scores were mostly within 85-89 or knowledgeable comprising 65.6%. There were 15.6% of students who are very knowledgeable with test scores of 90-100 while 18.8% are fairly knowledgeable with test scores of 80-84. According to Tapia (2018), metacognitive knowledge can be understood as strategic knowledge, knowledge about cognitive tasks and (3) self-knowledge. As such, the results imply that the students were able to improve their abilities to remember, apply and reflect from the learnings they generated from the use of the self-directed learning material. In addition, Karlen (2016) assets that metacognition is most often studied in the context of self-

regulated learning, a common skill among high achieving students. This clearly indicates that the developed self-directed learning module enabled the students to develop their metacognition. The results were similar to the findings of Dignath, Buettner, and Langfeldt (2008), Donker et al. (2014), Hattie (2009) Ohtani and Hisasaka (2018) and Hattie (2009) that metacognition and students' academic performance are positively linked together.

Table 2. Students' assessment of the self-directed module for food service management in terms of clarity of instruction

Statements	Mean	SD	VI
Contents of the module are free from material errors	4.16	0.95	Highly Manifested
Module contains specific and clear instructions	4.16	0.68	Highly Manifested
Topics covered are within the curriculum standards	4.34	0.60	Highly Manifested
Module sets clear expectations from the students	3.78	0.91	Highly Manifested
Module can be clearly understood by the intended users	4.38	0.71	Highly Manifested
Overall	4.16	0.53	Highly Manifested

Legend: 1.00-1.49- (Not at All Manifested)
1.50-2.49- (Rarely Manifested)
2.50-3.49- (Moderately Manifested)
3.50-4.49- (Highly Manifested)
4.50-5.00- (Extremely Manifested)

Table 2 reflects the students' assessment of the self-directed module for food service management in terms of clarity of instruction. The overall assessment resulted to high manifestations of the clarity of instructions in the self-directed learning module with all the indicators garnered 'highly manifested' ratings. The highest rating of 4.38 (SD=0.71) was given to "Module can be clearly understood by the intended users." The topics in the module are arranged properly according to the different food preparation techniques. In addition, it

lists the different terminologies the student should learn, provide clear discussions of the preparation techniques and supplements the discussions with the sequence of activities and actions related to the topics. Meanwhile, the lowest rating of 3.78 was given to "Module sets clear expectations from the students."

Table 3. Students' assessment of the self-directed module for food service management in terms of Objective Set

Statements	Mean	SD	VI
Each topic contains learning objectives	4.63	0.55	Extremely Manifested
Objectives measure the knowledge required for the topic	4.13	0.66	Highly Manifested
Objectives set the module outcomes	4.16	0.85	Highly Manifested
Objectives clearly identify the theoretical and practical components of the topic	4.03	0.74	Highly Manifested
Objectives clearly identify the skills required for the topic	4.44	0.50	Highly Manifested
Overall	4.28	0.47	Highly Manifested

Legend: 1.00-1.49- (Not at All Manifested)
1.50-2.49- (Rarely Manifested)
2.50-3.49- (Moderately Manifested)
3.50-4.49- (Highly Manifested)
4.50-5.00- (Extremely Manifested

Table 3 shows the students' assessment of the self-directed module for food service management in terms of objective set. The overall assessment resulted to high manifestations of the objectives in the self-directed learning module with four indicators garnered 'highly manifested' ratings while one indicator with 'extremely manifested'. The highest rating of 4.63 (SD=0.55) was given to "Each topic contains learning objectives." The module is properly formatted that each topic presented starts with the topic objectives. These objectives reflect the contents and expectations from the students. Meanwhile, the lowest rating of 4.03 was given to "Objectives clearly identify the theoretical and practical components of the topic."

Table 4 provides the students' assessment of the self-directed module for food service management in terms of accessibility. The overall assessment of 4.13 (SD=0.55) resulted to high manifestations of the accessibility of the self-directed learning module with four indicators garnered 'highly manifested' ratings while one indicator with 'extremely manifested'. The highest rating of 4.88 (SD=0.34) equivalent to 'extremely manifested' was given to "Each student is given a copy of the module." During the online classes, students were given soft copies of the module. They have the options to printout their own copies of the module. The lowest rating of 3.47 was given to "The learners can use the module even without supervision."

Table 4. Students' assessment of the self-directed module for food service management in terms of Accessibility

Statements	Mean	SD	VI
The module is easy to use	4.22	0.83	Highly Manifested
Each student is given a copy of the module	4.88	0.34	Extremely Manifested
The module is user friendly	4.34	0.65	Highly Manifested
The learners can use the module even without supervision	3.47	1.16	Highly Manifested
The instructions/topics are easy to follow	3.75	1.02	Highly Manifested
Overall	4.13	0.55	Highly Manifested

Legend: 1.00-1.49- (Not at All Manifested)
1.50-2.49- (Rarely Manifested)
2.50-3.49- (Moderately Manifested)
3.50-4.49- (Highly Manifested)
4.50-5.00- (Extremely Manifested

Table 5 displays the results of the students' assessment of the self-directed module for food service management in terms of language used. The overall assessment garnered an average weighted mean of 3.75 (SD=0.65) with a verbal interpretation of 'highly manifested' with four indicators garnered 'highly manifested' ratings while one indicator with 'moderately manifested' evaluation. The highest rating of 3.94 (SD=0.72) was given to "The language is

appropriate for the intended users." The module is written in English, a language necessary for learning different terminologies in the food service management. Since there were no direct tagalog translations of the different terminologies used in food service management, the students find the use of English language appropriate for the module. Meanwhile, the lowest rating of 3.47 (SD=1.05) was given to "The color, font style and font sizes are appealing to the users."

Table 5. Students' assessment of the self-directed module for food service management in terms of Language Used

Statements	Mean	SD	VI
The language is appropriate for the intended users	3.94	0.72	Highly Manifested
The color, font style and font sizes are appealing to the users	3.47	1.05	Moderately Manifested
The words used are suitable for the intended users	3.75	0.80	Highly Manifested
The sentence structure, format and style are comprehensible	3.72	0.85	Highly Manifested
The over-all content of the module is clear	3.88	0.79	Highly Manifested
Overall	3.75	0.65	Highly Manifested

Legend: 1.00-1.49- (Not at All Manifested)
1.50-2.49- (Rarely Manifested)
2.50-3.49- (Moderately Manifested)
3.50-4.49- (Highly Manifested)
4.50-5.00- (Extremely Manifested

The students' evaluation of the self-directed learning module shows the acceptability of the developed module as a learning material. As described by Jayasree (2004) and Macarandang (2009), the self-directed module contains small-step, sequential and concept- and/or skill-oriented presentation of a unit of learning designed to bring about a satisfactory level kind of learning among slow, average and fast learners. The module ensures that students have control over their learning activities (Brookfield, 2013; Sze-Yeng & Hussian 2010). The

results of the evaluations are in line with the descriptions of Deci and Ryan (2008) that learning tasks become personally meaningful, interesting, enjoyable, and embedded with a sense of control or personal autonomy through self-directed learning. Similarly, the studies of Bonk and Lee (2017) and Ramos et al. (2021) found improvements in the students' academic performance thru the use of self-directed learning materials because learners can freely and openly explore learning experiences. This is also similar to the study of Agrawal et al. (2019) that majority of the students (84%) have found SDL as a more interesting and enthusiastic way of learning. Majority of students found SDL an enjoyable form of learning that gives ample opportunity to interact with the faculty.

Students' evaluation of the efficacy of the components of self-directed learning module in terms of learning objectives, learning content, self-assessment, task sheet, job sheet and performance criteria checklist.

Table 6. Students' evaluation of the efficacy of the components of self-directed learning module in terms of Learning Objectives

Statements	Mean	SD	VI
The learning objectives are…			
Appropriate to the year level	4.13	0.79	Highly Observed
Relevant for each specific topic	3.59	1.10	Highly Observed
Clear and understandable	4.00	0.80	Highly Observed
Measurable	3.84	0.81	Highly Observed
Achievable	4.03	0.78	Highly Observed
Overall	3.92	0.61	Highly Observed

Legend: 1.00-1.49- (Not at All Observed)
1.50-2.49- (Rarely Observed)
2.50-3.49- (Moderately Observed)
3.50-4.49- (Highly Observed)
4.50-5.00- (Extremely Observed)

Table 6 shows the students' evaluation of the efficacy of the components of the self-directed module for food service management in terms of learning objectives. The overall assessment garnered an average weighted mean of 3.92 (SD=0.61) with a verbal interpretation of 'highly observed' with all indicators garnered 'highly observed' ratings. The highest

weighted mean of 4.13 (SD=0.79) was achieved by "The learning objectives are appropriate to the year level." In terms of the objectives, the module used the required learning outcomes for the food service management as prescribed by the Technical Education, Skills and Development Authority (TESDA). This ensures that all the required topics have appropriate learning objectives geared towards the achievement of the learning outcomes. Meanwhile, the lowest rating of 3.59 (SD=1.10) was given to "The learning objectives are relevant for each specific topic." Although the statement was given the lowest rating, it was still rated highly observed.

Table 7. Students' evaluation of the efficacy of the components of self-directed learning module in terms of Learning Content

Statements	Mean	SD	VI
Learning Activities/ Contents…			
Cover the syllabus for the subject	3.94	0.67	Highly Observed
Are appropriate to the grade level	4.25	0.67	Highly Observed
Are suitable to the topic	3.91	0.78	Highly Observed
Are realistic and doable	4.03	0.69	Highly Observed
Can entice interest of the students	3.25	0.95	Moderately Observed
Overall	3.88	0.50	Highly Observed

Legend: 1.00-1.49- (Not at All Observed)
1.50-2.49- (Rarely Observed)
2.50-3.49- (Moderately Observed)
3.50-4.49- (Highly Observed)
4.50-5.00- (Extremely Observed)

Table 7 indicates the evaluation of the efficacy of the learning content of the food service management self-directed learning module. The overall assessment showed an average weighted mean of 3.88 (SD=0.50) with a verbal interpretation of 'highly observed.' All indicators garnered 'highly observed' ratings with the highest weighted mean of 4.25 (SD=0.67) given to "Learning Activities/ Contents cover the syllabus for the subject." The module is very comprehensive at it covers all the required topics for the food service management. The contents of the module are parallel to the requirements of TESDA and

Commission on Higher Education (CHED). This infuses both the theoretical concepts required by CHED and the practical applications required by TESDA. On the other hand, the lowest rating of 3.25 (SD=0.95) was given to "Learning Activities/ Contents can entice interest of the students." This statement was rated low because the module contains mostly activities and practical applications that students oftentimes dislike.

Table 8. Students' evaluation of the efficacy of the components of self-directed learning module in terms of Self-Assessment

Statements	Mean	SD	VI
Self-assessment…			
Gives easy to follow instructions	3.88	0.71	Highly Observed
Provides opportunity for student reflection of learnings	4.19	0.64	Highly Observed
Organizes students' level of knowledge	4.13	0.61	Highly Observed
Gives individual feedback	3.56	1.01	Highly Observed
Provides grading system that incorporates practical and theoretical components of the subject	3.78	0.87	Highly Observed
Overall	3.91	0.58	Highly Observed

Legend: 1.00-1.49- (Not at All Observed)
1.50-2.49- (Rarely Observed)
2.50-3.49- (Moderately Observed)
3.50-4.49- (Highly Observed)
4.50-5.00- (Extremely Observed)

Table 8 shows the evaluation of the efficacy of the self-assessment component of the food service management self-directed learning module. The overall assessment showed an average weighted mean of 3.91 (SD=0.58) with a verbal interpretation of 'highly observed.' All indicators also garnered 'highly observed' ratings with the highest weighted mean of 4.19 (SD=0.64) given to "Self-assessment provides opportunity for student reflection of learnings." The module contains sections for student reflections. This upholds the metacognition where students apply the theoretical concepts and reflect on their own learning. It also contains self-

check parts in order for the students to evaluation their own performance. Meanwhile, the lowest rating of 3.56 (SD=1.01) was given to "Self-assessment gives individual feedback."

Table 9. Students' evaluation of the efficacy of the components of self-directed learning module in terms of Task Sheet

Statements	Mean	SD	VI
Task sheets…			
Gives easy to follow instructions	3.69	1.00	Highly Observed
Provides activities relevant to the module content	4.47	0.57	Highly Observed
Intends to enhance students' level of knowledge	2.91	1.17	Moderately Observed
Gives feedback on the required output	3.16	1.14	Moderately Observed
Provides clear criteria for grading	3.03	1.09	Moderately Observed
Overall	3.45	0.79	Highly Observed

Legend: 1.00-1.49- (Not at All Observed)
1.50-2.49- (Rarely Observed)
2.50-3.49- (Moderately Observed)
3.50-4.49- (Highly Observed)
4.50-5.00- (Extremely Observed)

Table 9 shows the evaluation of the efficacy of the task sheet component of the food service management self-directed learning module. The overall assessment showed an average weighted mean of 3.45 (SD=0.79) with a verbal interpretation of 'highly observed.' Two indicators garnered 'highly observed' ratings with the highest weighted mean of 4.47 (SD=0.57) given to "Task sheets provide activities relevant to the module content." The students particularly enjoy the task sheets because of the practical application. Since the subject is food service management, the students are more adept in their practical tasks than the theoretical parts. Meanwhile, the lowest rating of 2.91 (SD=1.17) was given to "Intends to enhance students' level of knowledge." Three statements were rated "moderately observed."

Table 10. Students' evaluation of the efficacy of the components of self-directed learning module in terms of Job Sheet

Statements	Mean	SD	VI
Job Sheet…			
Gives easy to follow instructions	3.25	1.08	Moderately Observed
Provides activities relevant to the module content	4.47	0.62	Highly Observed
Intends to enhance students' level of knowledge	3.22	1.04	Moderately Observed
Gives feedback on the required output	3.03	1.20	Moderately Observed
Provides clear criteria for grading	3.75	0.84	Highly Observed
Overall	3.54	0.81	Highly Observed

Legend: 1.00-1.49- (Not at All Observed)
1.50-2.49- (Rarely Observed)
2.50-3.49- (Moderately Observed)
3.50-4.49- (Highly Observed)
4.50-5.00- (Extremely Observed)

Table 10 shows the assessed efficacy of the job sheet component of the food service management self-directed learning module. The overall assessment proved that the indicators were 'highly observed' with average weighted mean of 3.54 (SD=0.81). The students' assessments were varied according to indicators such that only two indicators were rated 'highly observed' while the other three indicators were rated 'moderately observed.' The highest weighted mean of 4.47 (SD=0.62) was given to "Job sheet provides activities relevant to the module content." Because all the topics have theoretical and practical applications, the module provides activities that are relevant to the topics. As such, the students particularly can apply the theories in their practical tasks. Meanwhile, the lowest rating of 3.03 (SD=1.20) was given to "Job sheet gives feedback on the required output."

Table 11. Students' evaluation of the efficacy of the components of self-directed learning module in terms of Performance Criteria Checklist

Statements	Mean	SD	VI
Performance criteria checklist…			
Gives easy to follow instructions	3.50	1.14	Highly Observed
Provides opportunity for student reflection of learnings	3.75	0.92	Highly Observed
Organizes students' level of knowledge	3.53	0.95	Highly Observed
Gives individual feedback	3.19	1.06	Moderately Observed
Provides grading system that incorporates practical and theoretical components of the subject	3.16	1.02	Moderately Observed
Overall	3.43	0.83	Moderately Observed

Legend: 1.00-1.49- (Not at All Observed)
1.50-2.49- (Rarely Observed)
2.50-3.49- (Moderately Observed)
3.50-4.49- (Highly Observed)
4.50-5.00- (Extremely Observed)

Table 11 shows the evaluation of the efficacy of the performance checklist component of the food service management self-directed learning module. The overall assessment showed an average weighted mean of 3.43 (SD=0.83) with a verbal interpretation of 'moderately observed.' Three indicators garnered 'highly observed' ratings while there were two indicators with 'moderately observed' ratings. The highest weighted mean of 3.75 (SD=0.92) was given to "Performance Criteria Checklist provides opportunity for student reflection of learnings." The performance criteria provide a well-designed rubric to assess the students learning. It contains indicators, ratings and verbal interpretations for students to analyze and evaluate their own performances. Meanwhile, the lowest rating of 3.16 (SD=1.02) was given to "Performance Criteria Checklist provides grading system that incorporates practical and theoretical components of the subject."

The results of the evaluations showed that the students' accepted the major components of the self-directed learning module in food service management. The perception and acceptance of the students of the various components of the SLM are similar to the descriptions by the various researchers around the world. For instance, Douglas and Morris (2014), assert that group work assignments provide students with opportunities to share and to explain what they have learned to others, thereby reinforcing their own understanding of subject matter and confidence in their own abilities. Meanwhile, Bryan (2015) mentions that interactive online environments provide valuable opportunities for a variety of collaborative learning projects and Robertson (2011) supports collaboration with peers can foster self-directed learning and increase the intrinsic motivation to learn. Since the developed SLM has been contextualized to cater the needs of the students in the food service management subject, it supports the recommendations of Butcher and Sumner (2011) that personalizing learning tasks may assist learners in encoding new knowledge within existing cognitive frameworks.

The components of the SLM are similar to the suggestions given by several authors. For example, Rampai (2015) supports the self-monitoring, self-assessment, and goal selection which are part of the developed SLM. Similarly, the lessons are congruent with the process given by Loyens et al. (2008) on the use of SDL and also similar to the four phases as suggested by Thornton (2010). However, the student success lies on different factors mentioned by Perry, Phillips, & Hutchinson (2006) such as good learning habit, understanding of the learning resource, challenging tasks, and extra effort to learn new concept.

Table 12 lists the various challenges faced by the students in their use of the self-directed learning module for food service management. The foremost challenges faced by the students include no support from the family and/or community (16.1%), no available materials as required for the tasks (16.1%), performance tasks require a lot of time (14.5%), module has poor designs (12.9%), performance tasks are difficult to follow (11.3%). These reasons are expected from the nature of the students in the DLL. Since most of the students are from the marginalized sector, they have limited resources and support from the family and the community. Majority of these students are working while studying, the time requirement for the SLM is limited. Since the subject is technical in nature, following the performance tasks is difficult for students with limited knowledge of the food and beverage. There are mostly technical terms that students need to know and understand to perform certain tasks.

Table 12. Challenges faced by students in the use of self-directed module for food service management

Challenges	f	%
No available materials to perform the tasks	3	4.8
No available materials as required for the tasks	10	16.1
No time to read the module	2	3.2
It takes long time to follow the instructions	4	6.5
Performance tasks are difficult to follow	7	11.3
Module has poor designs	8	12.9
Module is not appropriate for the subject	-	0.0
No support from the family and/or community	10	16.1
Need support from teacher/facilitator	4	6.5
Module is not appropriate to the level of students	3	4.8
Performance tasks require a lot of time	9	14.5
Language is not clearly understood	2	3.2
TOTAL	62	100.0

There are several reasons associated with the use of the SLM. Since the nature and characteristics of the student-participants in this study are different, the results mostly contradict previous studies. For instance, Brookfield (2013) and Sze-Yeng and Hussian (2010) mentioned that learners assume more control over their learning activities which contradicts the main challenge of the student-respondents. Similarly, Macarandang (2009) mentions that instructional materials include a self -contained, independent unit of instruction prepared for the purpose of attaining defined instructional objectives that allows a learner to work at his/her own pace rather than the pace of the group, which can be too fast or too slow. However, this is not the case for the student-respondents in this study.

Table 13. Test of significant difference between the pre-test and post-test scores of the students

Performance Level Pre-Post	Pretest		Posttest		t	df	Sig. (2-tailed)
	Mean	SD	Mean	SD			
Factual	76.63	4.38	87.16	3.17	-13.656	31	.000
Conceptual	81.16	3.20	88.44	2.15	-13.364	31	.000
Procedural	87.03	2.01	89.22	1.70	-7.073	31	.000
Metacognitive	87.00	2.36	90.69	2.52	-11.451	31	.000

Table 13 shows the test of difference between the pretest and posttest scores of the student-respondents in the four dimensions of knowledge such as factual, conceptual, procedural and metacognitive. Since the sig. (2-tailed) obtained by the indicators are all .000 lower than the .05 margin of error, the test of difference shows significant difference between the pretest and posttest scores of the students in food service management. This implies that the scores of the students in the posttest are significantly higher than their scores in the pretest. As such, the SLM developed for the subject has been capable of increasing the level of knowledge of the students. The improvements in the test scores of the students are attributed to their abilities to follow through the module contents, instructions and activities. Since the module contains clear and specific instructions for each topic and tasks, the students were able to follow and complete the required tasks. Similarly, the module is concise and clear in terms of discussions of terminologies, practical applications of the theories and step-by-step procedures in performance tasks. All these contributed to the abilities of the students to improve their level of knowledge.

The results of the current study are congruent with the study of Kidane et al. (2020) that found a significant increase in SDL score on comparing students at year-1 with students at year-2 ($p = 0.002$). Both year-1 and 2 students rated PBL tutorial discussion and tutors had high influence on their individual learning. However, it contradicts the study of Lazou et al. (2012) that university students have an imperfect knowledge and usually partake in practices of food handling that is hazardous even students who come from courses related to food safety. It also contradicts the study of Gurudasani and Sheth (2009) that there was inconsistency in consumers' concern towards food safety in terms of knowledge and practices of the household. Behavioral changes do not necessarily occur with sufficient amount of knowledge, along with

various programs for hygiene education that failed to serve its purpose to create changes (Greyson, 2016).

Table 13 shows the test of relationship between the students' level of knowledge and their assessments of the SLM, efficacy of the SLM and the challenges faced in using the SLM. Since the results are significantly lower and far distant from the perfect correlation coefficient of 1, it is clear that there were no significant relationships among all the variables. This means the performance level of the students has no statistical relationships with their evaluation of the SLM. It entails that students' perception of the SLM in terms of its usability and acceptability has no effect on their performance in the pretest and posttest.

Table 14. Test of significant relationship between the students' performance and the assessment of SLM, efficacy of SLM and challenges in SLM

	Performance Level			
	Factual	Conceptual	Procedural	Metacognitive
Assessment				
Clarity of Instruction	.224	.009	.103	-.063
Objective Set	.250	.283	-.198	.080
Accessibility	.219	-.039	.195	.211
Language Used	-.049	-.108	.098	.360
Efficacy				
Learning Objectives	.259	-.016	-.384	.089
Learning Content	-.245	-.206	.232	.050
Self-Assessment	-.339	-.188	.303	-.069
Task Sheet	-.332	-.244	.193	.005
Job Sheet	-.121	-.077	.210	.007
Performance Criteria Checklist	-.004	.044	.217	-.193
Challenges	.000	.063	-.127	.079

The weak correlation is shown in the table as positive and negative. Accordingly, the correlation coefficient of lower than 0.5 is considered weak and bears no statistical significant relationship with any of the variable. For instance, the assessment of the module has very weak

correlations with the students' performance levels in terms of clarity of instruction (factual: .224; conceptual: .009; procedural: .103; metacognitive: -.063), objective set (factual: .250; conceptual: .283; procedural: -.198; metacognitive: .080), accessibility (factual: .219; conceptual: -.039; procedural: .195; metacognitive: .211) and language used (factual: -.049; conceptual: -.108; procedural: .098; metacognitive: .360). All these correlation coefficients show weak to very weak statistical relations. Similarly, the test of efficacy in terms of learning objectives (factual: .259; conceptual: -.016; procedural: -.384; metacognitive: .089), learning content (factual: -.245; conceptual: -.206; procedural: .232; metacognitive: .050), self-assessment (factual: -.339; conceptual: -.188; procedural: .303; metacognitive: -.069), task sheet (factual: -.332; conceptual: -.244; procedural: .193; metacognitive: .005), job sheet (factual: -.121; conceptual: -.077; procedural: .210; metacognitive: .007) and performance criterial checklist (factual: -.004; conceptual: .044; procedural: .217; metacognitive: -.193) have weak to very weak correlation coefficients. Lastly, the challenges experienced by the students all have weak relationships with the level of knowledge in terms of factual (.000), conceptual (.063), procedural (-.127) and metacognitive (.079).

5. Conclusion

The null hypothesis is rejected because there is significant difference between the pre-test and post-test scores of the students in food service management. The null hypothesis is not rejected because there is no significant relationship between the students' performance and the assessment of SLM, Efficacy of SLM and Challenges in SLM.

Since the students generally accepted the self-directed learning module in food service management, the teachers of the subject could continuously use the module during or even after the hybrid learning modality. The possibility of extending the same format of the module to other subjects is highly encouraged. The current style and format of the self-directed learning module for food service management may be enhanced based on the challenges faced by the students. The contents can also be contextualized based on the needs of the students. The college through the different departments may support the continuous development of self-directed learning modules in various subjects. The modules bridge the gap on the lack of educational resources. The department may organize training programs for students on the

better utilization of self-directed learning modules. This will not only address the challenges they encountered but will also assist them on the improvement of their academic performance.

References

Al Haddad, A. (2011, November 11). Too smart for school, too young for college. The National. Available from: http://www.thenational.ae/news/uae-news/too-smart-for-school-too-young-for-college

Andrade, A. (2017). Understanding student learning trajectories using multimodal learning analytics within an embodied-interaction learning environment. ACM International Conference on LAK, 70–79. https://doi.org/10.1145/3027385.3027429.

Aspasia Dania, Dimitrios Hatziharistos, Maria Koutsouba and Vasiliki Tyrovola (2011). The use of technology in movement and dance education: Recent practices and future perspectives. Procedia - Social and Behavioral Sciences. Volume 15, 2011, Pages 3355-3361

Baroody, A. J. (2003). The development of adaptive expertise and flexibility: The integration of conceptual and procedural knowledge. Mahwah, NJ: Erlbaum

Baroody, A. J., Feil, Y., & Johnson, A. R. (2007). An alternative reconceptualization of procedural and conceptual knowledge. Journal for Research in Mathematics Education, 38, 115-131.

Barrett B, Brown R, Rakel D, Mundt M, Bone K, Barlow S,(2010). Echinacea for treating the common cold: A randomized trial. Annals of Internal Medicine. 2010;153 (12):769–77.

Barrot, J.S., Llenares, I.I. & del Rosario, L.S. (2021). Students' online learning challenges during the pandemic and how they cope with them: The case of the Philippines. Educ Inf Technol 26, 7321–7338. https://doi.org/10.1007/s10639-021-10589-x

Bonk, C. J. (July 2009). The world is open: How Web technology is revolutionizing education. San Francisco, CA: Jossey-Bass.

Bonk, C. J., & Lee, M. M. (2017). Motivations, Achievements, and Challenges of Self-Directed Informal Learners in Open Educational Environments and MOOCs. Journal of Learning for Development , 4(1). Retrieved from https://jl4d.org/index.php/ejl4d/article/view/195

Boshorr, N. (2014). Types of knowledge in science-based practices. Journal of Science Communication. 1824 – 2049

Brookfield, S. D. (2013). Powerful techniques for teaching adults. San Francisco, CA: Jossey-Bass

Bryan, V. C. (2015). Self-directed learning and technology. The Education Digest, 80(6), 42-44. Retrieved June 9, 2015 from ProQuest database.

Butcher, K. R., & Sumner, T. (2011). Self-directed learning and the sensemaking paradox. Human-Computer Interaction, 26(1), 123-159. Retrieved August 6, 2015 from EBSCOhost database.

Canobi, K. H. (2009). Concept-procedure interactions in children's addition and subtraction. Journal of Experimental Child Psychology, 102, 131-149. https://doi.org/10.1016/j.jecp.2008.07.008

Center on the Developing Child. (2020). Executive function & self-regulated learning. Retrieved from https://developingchild.harvard.edu/science/key-concepts/executive-function/

Chandrasekaran, A. (2012, October 15). Lacking teachers and textbooks, India's schools turn to the Khan Academy to survive. The New York Times Blog. Available from: http://india.blogs.nytimes.com/2012/10/15/lacking-teachers-and-textbooks-indias-schools-turn-to-khanacademy-to-survive/

Chinn, S. (2012).The Trouble with Maths: A Practical Guide to Helping Learners with Numeracy Difficulties. NY, Routledge.

Clark, E. (2011). Concepts as organizing frameworks. Encounter, 24(3), 32-44. Retrieved from: www.ojs.greatideas.org/Encounter/Clark243.pdf (Original work published in 1997).

Conley, D. T. (2014). Learning strategies as metacognitive factors: A critical review. Eugene, OR: Educational Policy Improvement Center.

Cross, J. (2007). Informal learning: Rediscovering the natural pathways that inspire innovation and performance. San Francisco, CA: Pfeiffer/Wiley.

D. O'Brien (2006), An introduction to the theory of knowledge, Polity Press, Cambridge, U.K.

Di Mitri, D., Börner, D., Scheffel, M., Ternier, S., Drachsler, H., Specht, M. (2017). Learning pulse: A machine learning approach for predicting performance in self-regulated

learning using multimodal data. ACM International Conference on LAK, 188–197. https://doi.org/10.1145/3027385.3027447.

Dignath, C., Buettner, G., & Langfeldt, H. P. (2008). How can primary school students learn self-regulated learning strategies most effectively? A meta-analysis on self-regulation training programmes. Educational Research Review, 3, 101–129.

diSessa, A. A., Gillespie, N. M., & Easterly, J. B. (2004). Coherence versus fragmentation in the development of the concept of force. Cognitive Science, 28, 843-900. https://doi.org/10.1207/s15516709cog2806_1

Donker, A. S., de Boer, H., Kostons, D., van Ewijk, C. D., & van der Werf, M. P. (2014). Effectiveness of learning strategy instruction on academic performance: A meta-analysis. Educational Research Review, 11, 1–26.

Dopson, L.R. & Nelson, A. A (2003.) Future of Hotel Education: Required program content areas for graduates of US hospitality program beyond year 2000 - part two. Journal of Hospitality & Tourism Education" The International Journal of Theories and Practice" Vol. 15, No. 3. pp. 11-17

Douglas, C., & Morris, S. (2014). Student perspectives on self-directed learning. Journal of the Scholarship of Teaching & Learning, 14(1), 13-25. Retrieved August 12, 2015 from EBSCOhost database.

Dynan, L., Cate, T., & Rhee, K. (2008). The impact of learning structure on students' readiness for self-directed learning. Journal of Education for Business, 84, 96-101.

Erwin E. Rotas, EE and Cahapay, MB (2020). Difficulties in Remote Learning: Voices of Philippine University Students in the Wake of COVID-19 Crisis. Asian Journal of Distance Education Volume 15, Issue 2.

G. Ryle (1971), "Knowing how and knowing that", in Collected papers: Volume II of collected essays, 1929–1968, Hutchinson & Co, London, U.K.

G. Ryle (1971), "Knowing how and knowing that", in Collected papers: Volume II of collected essays, 1929–1968, Hutchinson & Co, London, U.K.

Gade S, Chari S. (2013). Case-based learning in endocrine physiology: an approach toward self-directed learning and the development of soft skills in medical students. Adv Physiol Educ. 2013;37(4):356–60.

Gade S, Chari S. Case-based learning in endocrine physiology: an approach toward self-directed learning and the development of soft skills in medical students. Adv Physiol Educ. 2013;37(4):356–60.

Garrison, D.R, (1997). Self directed learning: Toward a comprehensive model, Adult Education Quarterly, 48 (1) 18-29.

Gascoine, L. and Higgins, S. & Wall, K. (2017). The assessment of metacognition in children aged 4-16 years: A systematic review. Review of Education, 5, 3–57.

Hallett, D., Nunes, T., Bryant, P., & Thorpe, C. M. (2012). Individual differences in conceptual and procedural fraction understanding: the role of abilities and school experience. Journal of experimental child psychology, 113(4), 469–486. https://doi.org/10.1016/j.jecp.2012.07.009

Hattie, J. (2009). Visible learning: A synthesis of over 800 meta-analyses relating to achievement. New York, NY: Routledge.

Hew K.F., Cheung W.S. (2014) Enhancing Students' Learning of Factual Knowledge. In: Using Blended Learning. SpringerBriefs in Education. Springer, Singapore. https://doi.org/10.1007/978-981-287-089-6_6

Hiebert, J., & Lefevre, P. (1986). Conceptual and procedural knowledge in mathematics: An introductory analysis. In J. Hiebert (Ed.), Conceptual and procedural knowledge: The case of mathematics (pp. 1-27). Hillsdale, NJ: Erlbaum.

Howard, S. J., & Vasseleu, E. (2020). Self-Regulation and executive function longitudinally predict advanced learning in preschool. Frontiers in Psychology, 11, 1–9.

J. L. Van der Walt (2019). "The term "Self-Directed learning"-back to Knowles, or another way to forge ahead?" Journal of Research on Christian Education, vol. 28, no. 1, pp. 1–20, 2019.

J. Rycroft-Malone, K. Seers, A. Titchen, G. Harvey, A. Kitson and B. McCormack (2004), "What counts as evidence in evidence-based practice?", J. Adv. Nurs. 47: 81–90

Janotha B. (2015). The effect of team-based learning on student self-directed learning. Ann Arbor: ProQuest LLC.

Janotha B. The effect of team-based learning on student self-directed learning. Ann Arbor: ProQuest LLC; 2015. 8.

Jayasree, P. (2004). Distance Education and Improvement of Curriculum, P.G (Pedagogics, Vol.Attended Workshop on "Innovative Strategies for the Effective Transaction of instructions, pp 55-59)

Kalantzis, M. (2003). Assessing multiliteracies and the new basics. Assessment in Education: Principles, Policy, and Practice, 10(1), 15. Retrieved July 25, 2015 from EBSCOHost database.

Karlen, Y. (2016). Differences in students' metacognitive strategy knowledge, motivation, and strategy use: A typology of self-regulated learners. Journal of Educational Research, 109, 253–265.

Kidane, H.H., Roebertsen, H. & van der Vleuten, C.P.M. (2020). Students' perceptions towards self-directed learning in Ethiopian medical schools with new innovative curriculum: a mixed-method study. BMC Med Educ 20, 7 (2020). https://doi.org/10.1186/s12909-019-1924-0

Knowles, M.S. (1975). Self-directed learning: A guide for learners and teachers. New York: Association Press.

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. Theory into practice, 41(4), 212-218.

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. Theory into practice, 41(4), 212-218.

La Porte, A. M. (2015). Older adult responses to art curriculum and self-directed learning. International Journal of Education through Art, 11(1), 59-74. Retrieved August 5, 2015 from EBSCOhost database.

Leland, J. (2012, March 9). Adventures of the teenage polyglot. The New York Times. Available from: http://www.nytimes.com/2012/03/11/nyregion/a-teenage-master-of-languages-finds-onlinefellowship.html?pagewanted=all

Macarandang, M. A. (2009). Evaluation of a proposed set of modules in principles and methods of teaching.

Maile, C. A., & Coope, M. S. (2004). The CIMC Guide to Developing Modules for Self-Paced Learning. Curriculum and Instructional Materials Center A Division of the Oklahoma Department of Career and Technology Education. okcimc.com.

Majumdar, R., Yang, Y.Y., Li, H., Akçapinar, G., Flanagan, B., Ogata, H. (2019). Adaptive support for acquisition of self-direction skills using learning and health data. In 2019

IEEE 19th International Conference on Advanced Learning Technologies (ICALT), volume 2161-377X. Curran Associates, Brazil, (pp. 54–56).

Martin, W.G. (2009). The NCTM High School curriculum project: Why it matters to you. Mathematics Teacher, 103(3), 164-166. https://doi.org/10.5951/MT.103.3.0164

Miller, S.P., & Hudson, P.J. (2007). Using evidence-based practices to build mathematics competence related to conceptual, procedural, and declarative knowledge. Learning Disabilities Research and Practice, 22(1), 47-57. https://doi.org/10.1111/j.1540-5826.2007.00230.x

Miller, S.P., & Hudson, P.J. (2007). Using evidence-based practices to build mathematics competence related to conceptual, procedural, and declarative knowledge. Learning Disabilities Research and Practice, 22(1), 47-57. https://doi.org/10.1111/j.1540-5826.2007.00230.x

Mobus, G. (2018), “Teaching Systems Thinking to General Education Students”, Ecological Modeling, Vol. 373, pp. 13-21, http://dx.doi.org/doi.org/10.1016/j.ecolmodel.2018.01.013.

Mohmmed, A. O., Khidhir, B. A., Nazeer, A., & Vijayan, V. J. (2020). Emergency remote teaching during Coronavirus pandemic: the current trend and future directive at Middle East College Oman. Innovative Infrastructure Solutions, 5(3), 1-11.

Mohmmed, A.O., Khidhir, B.A., Nazeer, A. (2020). Emergency remote teaching during Coronavirus pandemic: the current trend and future directive at Middle East College Oman. Innov. Infrastruct. Solut. 5, 72 (2020). https://doi.org/10.1007/s41062-020-00326-7

Moser, T. and Chen, V. (2016). What is Conceptual Understanding? Getting Smart.

Neuenhaus, N., Artelt, C., Lingel, K., & Schneider, W. (2011). Fifth graders metacognitive knowledge: General or domain-specific? European Journal of Psychology of Education, 26, 163–178.

Ohtani, K., & Hisasaka, T. (2018). Beyond intelligence: A meta-analytic review of the relationship among metacognition, intelligence, and academic performance. Metacognition and Learning, 13, 179–212.

P, 21-Framework (2009). A framework for 21st century learning. http://www.p21.org/our-work/p21-framework. Accessed 30 July 2020.

P. Thagard (2006), “How to collaborate: procedural knowledge in the cooperative development of science”, Southern J. Philos. XLN: 177–196.

P. Thagard (2006), “How to collaborate: procedural knowledge in the cooperative development of science”, Southern J. Philos. XLN: 177–196.

Padmapriya, P. V. (2015). Effectiveness of self learning modules on achievement in biology among secondary school students. International Journal of Education and Psychological Research, 4(2), 44-46.

Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. Frontiers in Psychology, 8(422), 1–28.

Parsafar, S. & Tabtabaei, O. (2012). The effect of self-directed learning on critical thinking of Iranian EFL learners, Journal of educational and social research, 2, 55- 64.

Paul T. Beach, Ross C. Anderson, Jessica N. Jacovidis, and Kristine L. Chadwick (2020). Making The Abstract Explicit: The Role Of Metacognition In Teaching And Learning.

Perry, N. E., Phillips, L., & Hutchinson, L. (2006). Mentoring student teachers to support self-regulated learning. The Elementary School Journal, 106, 237-254.

Poonam Agrawal, Shinky Mehta and Niket Verma (2019). Perception analysis of students and faculty of a self-directed learning module in biochemistry in a north Indian medical college. Journal of Education Technology in Health Sciences, September-December, 6(3):72-76 72

Price-Mitchell, M. (2015). Metacognition: Nurturing Self-Awareness in the Classroom. Brain-based learning.

Rahman, M. H. (2015). LEARNING ASSESSMENT IN A SELF LEARNING MATERIAL. International Journal on New Trends in Education & Their Implications (IJONTE), 6(3).

Ramos, ES, de Guzman, MD and Rico, FM (2021). Utilization of Self-Learning Module in the New Normal and Academic Achievement in Economics of Students in Public Secondary Schools. International Journal of Computer Engineering in Research Trends Multidisciplinary, Volume-8, Issue-5.

Rampai, N. (2015). Model of knowledge management via social media to enhance graduated student's self-directed learning skill. International Journal of Information and Education Technology, 5(10), 799-802. Retrieved May 15, 2015 from ProQuest database.

Richland, L. E., Stigler, J. W., Holyoak, K. J. (2012). Teaching the conceptual structure of mathematics, Educational Psychologist 47(3), 189-203. https://doi.org/10.1080/00461520.2012.667065

Rittle-Johnson, B. (2017). Developing Mathematics Knowledge. Child Development Perspectives, 11(3), 184-190. https://doi.org/10.1111/cdep.12229

Rittle-Johnson, B. Fyfe, E., & Loehr, A. (2016). The content of instruction within a mathematics lesson: Implications for conceptual and procedural knowledge development. British Journal of Educational Psychology, 86, 576 - 591. https://doi.org/10.1111/bjep.12124

Rittle-Johnson, B. Schneider, M. & Star, J. (2015). Not a one-way street: Bi-directional relations between procedural and conceptual knowledge of mathematics. Educational Psychology Review, 27. https://doi.org/10.1007/s10648-015-9302-x

Rittle-Johnson, B., & Koedinger, K. R. (2009). Iterating between lessons concepts and procedures can improve mathematics knowledge. British Journal of Educational Psychology, 79, 483-500. https://doi.org/10.1348/000709908X398106

Rittle-Johnson, B., & Schneider, M. (2015). Developing conceptual and procedural knowledge of mathematics. In R. C. Kadosh & A. Dowker (Eds.), Oxford handbook of numerical cognition (pp. 1118-1134). Oxford, UK: Oxford University Press.

Rittle-Johnson, B., & Schneider, M. (2015). Developing conceptual and procedural knowledge in mathematics. In R. Cohen Kadosh & A. Dowker (Eds.), Oxford handbook of numerical cognition (pp. 1102-1118). Oxford, UK: Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199642342.013.014

Robertson, J. (2011). The educational affordances of blogs for self-directed learning. Computers & Education, 57(2), 1628–1644. Retrieved June 23, 2015 from Elsevier ScienceDirect database.

Roebers, C. M. (2017). Executive function and metacognition: Towards a unifying framework of cognitive selfregulation. Developmental Review, 45, 31–51.

S. Kerka (1994). Self-directed Learning: Myths and Realities, ERIC Clearinghouse on Adult, Career, and Vocational Education, Columbus, OH, USA, 1994.

Sadiq, S and Samir, S. (2014). Effectiveness of Modular Approach in Teaching at University Level. Journal of Education and Practice. Vol.5, No.17, 2014

Sadiq, S., & Zamir, S. (2014). Effectiveness of modular approach in teaching at university level. Journal of Education and Practice, 5(17), 103-109.

Savin-Baden M, Major CH. (2004). Foundations of problem-based learning. Maidenhead: Society for Research into Higher Education & Open University Press.

Savin-Baden M, Major CH. Foundations of problem-based learning. Maidenhead: Society for Research into Higher Education & Open University Press; 2004.

Schmidmaier, R., Eiber, S., Ebersbach, R. et al. Learning the facts in medical school is not enough: which factors predict successful application of procedural knowledge in a laboratory setting?. BMC Med Educ 13, 28 (2013). https://doi.org/10.1186/1472-6920-13-28

Schneider, M., & Stern, E. (2009). The Inverse Relation of Addition and Subtraction: A Knowledge Integration Perspective. Mathematical Thinking and Learning, 11, 92- 101. https://doi.org/10.1080/10986060802584012

Schraw, G., Crippen, K. J., & Hartley, K. (2006). Promoting self-regulation in science education: Metacognition as part of a broader perspective on learning. Research in Science Education, 36, 111–139.

Self-Directed Learning: A Four-Step Process (2019). Centre for Teaching Excellence, University of Waterloo.

Shaikh, R. B. (2013). Comparison of readiness for selfdirected learning in students experiencing two different curricula in one medical school. Gulf Medical Journal, 2, 27-31.

Skemp, R. R. (1978). Relational understanding and instrumental understanding. Arithmetic Teacher, 26(3), 9-15. https://doi.org/10.5951/AT.26.3.0009

Skemp, R. R. (1978). Relational understanding and instrumental understanding. Arithmetic Teacher, 26(3), 9-15. https://doi.org/10.5951/AT.26.3.0009

Song, L & Hill, J. (2007). A conceptual model for understanding self-directed learning in online Environments , journal of interactive online learning , 6 , 27- 39.

Song, L., & Hill, J. (2007). A conceptual model for understanding self-directed learning in online environments. Journal of Interactive Online Learning, 6(1), 27-42. Available from: http://www.ncolr.org/jiol/issues/pdf

Spann, C.A., Schaeffer, J., Siemens, G. (2017). Expanding the scope of learning analytics data: Preliminary findings on attention and self-regulation using wearable technology. ACM International Conference on LAK, 203–207.

Star, J. R. (2005). Reconceptualizing procedural knowledge. Journal for Research in Mathematics Education, 36, 404-411

Stockdale, S.L., & Brockett, R.G. (2011). Development of the PRO-SDLS: A measure of self-direction in learning based on the personal responsibility orientation model. Adult Education Quarterly, 61(2), 161–180.

Sze-Yeng, F., & Hussian, R. (2010). Self-directed learning in a socioconstructivist learning environment. Procedia Social and Behavioral Sciences, 9, 1913-1917.

Tapia,J. (2018). 4 Types of Knowledge. Learning Strategists.

Tay, L. Y., Chong, S. K., Ho, C. F., & Aiyoob, T. B. (2020). A Review of Metacognition: Implications for Teaching and Learning (NIE Working Paper Series No. 17). Singapore: National Institute of Education.

Torrefranca, E. (2017). Development and validation of instructional modules on rational expressions and variations. The Normal Lights, 11(1), 43 – 73.

Torrefranca, E. C. (2017). Development and validation of instructional modules on rational expressions and variations. The Normal Lights, 11(1).

Varga, N. L., & Bauer, P. J. (2017). Young adults self-derive and retain new factual knowledge through memory integration. Memory & cognition, 45(6), 1014–1027. https://doi.org/10.3758/s13421-017-0711-6

Varga, N.L., Bauer, P.J. Young adults self-derive and retain new factual knowledge through memory integration. Mem Cogn 45, 1014–1027 (2017). https://doi.org/10.3758/s13421-017-0711-6

Walker, J.T., & Lofton, S.P. (2003). Effect of a problem based learning curriculum on students' perceptions of self directed learning. Issues in Educational Research, 13, 71–100.

Westwood, P. (2008). What teachers need to know about numeracy [online]. ACER Press, Camberwell, Vic. Retrieved from: http://search.informit.com.au/documentSummary;dn=441576506871113;res=IELHSS >

Williamson, S.N. (2007). Development of a self-rating scale of self-directed learning. Nurse Researcher, 14(2), 66–83.

Winne, P. H., and Perry, N. E. (2000). Measuring self-regulated learning. In the M. Boekaerts, P. R. Pintrich, and M. Zeidner (Eds.), Handbook of self-regulation (pp. 531–566). Orlando, FL: Academic Press.