

The Mediating Effect of Self-Regulation on the Relationship between Self-Directed Learning and Digital Competence

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ABSTRACT

The purpose of this study was to discover the mediating effect of self-regulation on the relationship between self-directed learning and digital competence of students. The respondents of this study were the 300 grade 11 & 12 TVL senior high school students at Mati School of Arts and Trades selected through simple random sampling. Three adapted instruments were used to gather the data from the respondents. A quantitative method was employed to conduct the study and the tools used in analyzing the data were Mean, Pearson r, Regression and Medgraph using Sobel z-test. Results show that the grade 11 and 12 TVL senior high school students posted a high-level of self-directed learning, high-level of self-regulation, and a high level of digital competency. Findings also reveal that there is no significant relationship between self-directed learning and digital competence and self-regulation and digital competence show no significant relationship as well. However, between self-directed learning and self-regulation, the two variables show significant relationship. Further, it was found that there is no mediating effect of self-regulation to the relationship between self-directed learning and digital competence.

Keywords: mediating, self-regulation, self-directed learning, digital competence, Philippines

INTRODUCTION

To meet today's demand, students must strive to become more capable and competitive by learning how to create, control and manage content and information, direct communication tools and find solution to technological challenges (Kwon,2021). However, the use of technology is not effectively applied and practiced into online or classroom learning. According to Belmonte et al. (2019) students do not exhibit sufficient technological literacy skills that are imperative to educate the next generation of digital natives, or confidence in themselves to show and resolve problems through technological resources. While some studies have provided evidenced that students can perform positively in certain areas of digital competence, they still have a long way to go before they can acquire sufficient skills to become fully competent (López-Meneses et al.,2020).

The evolution of technology entails the Filipino students to acquire the digital skills integral to succeed in a digital environment. The present K–12 basic education curricula in the Philippines concentrate on ICT skills and not on digital skills. Recently, however, the DepEd's Shaping Paper (Department of Education, 2023) has put more emphasis and importance to digital skills as part of information, media, and technology skills. Digital literacy is defined as the capability to define, access, manage, integrate, communicate, evaluate, and create information through a diversified digital technologies and networked devices (i.e., internet platforms, social media, mobile devices, etc.) in a safe and suitable manner for taking part in education, society, and the economy (Espinosa,2023).

Theories, concepts and opinions of authorities relevant to this study are discussed in this section to provide a strong frame of reference about the variables under study. The independent variable is the self-directed learning were based on Malcolm Knowles (1975) which focuses on awareness, learning strategies, learning activities, evaluation, and interpersonal skills. The dependent variable is digital competence of students which focusses on information processing, communication, content creation, safety and problem solving (Thobita et al.,2021) while the mediating effect is on self-regulation (Şahin and Aybek, 2019).

Furthermore, self-directed learning skills are part of these skills. Research reveals that self-direction and lifelong learning are closely related with each other. According to Lemmetty (2020) and Tekkol (2018) self-direction is a prerequisite for lifelong learning, however Song (2021) accentuate the collective relationship between the two. Zhu (2021) claimed that self-directed learning can develop people to become lifelong learners. However, one of the prime goals of lifelong learning is to equip people with the skills and competencies that can empower them to learn on their own.

In addition, self-directed learning is a process in which learners have main control for planning, carrying out, and gauging their own learning experiences (Karataş & Arpacı, 2021). Under self-directed learning, the responsibility of learning change from an outside source—a teacher, for example—to the learner themselves. The learner's control and active engagement in the process are crucial to its success. The ideation, planning, carrying out, and assessment of learning under the direction of students are all included in self-directed learning. It could be regarded as an approach in organizing learning in which students direct the learning process. Self-directed learning can also be considered as the goal that students wants to achieve. To attain it, people become liable on their own learning accept personal autonomy and preferences (van Woezik et al.,2021).

Popa (2018) discovered a favorable correlation between self-directed learning and digital competence. According to the previous study, students with greater levels of self-directed learning tend to use digital tools more frequently, while Muñoz (2021) highlighted the role of teacher collaboration in enhancing students' digital competence. Morris (2021) and Morris (2019) both underscore the importance of digital technology in supporting self-directed learning, particularly in formal education. These findings collectively suggest that self-directed learning and digital competence are mutually reinforcing, with the former driving the effective utilization of digital tools and the latter enhancing the capacity to engage in self-directed learning.

There are numerous elucidations of the concept of digital competence, which is a wide concept (Gudmundsdottir et al., 2020). Digital competence is described as a set of required knowledge, skills and attitudes when using digital technologies to effectively improve our everyday life (Ferrari,2021). Digital competence is among the eight key life skills included by the European Commission in its recommendations on key competences for lifelong learning.

Research findings by Zhao et al. (2021), showed that students are good at addressing real-world technical problems. Most students, 58.6 rated themselves as good, which implies that they can identify their needs and provide technical replies. In terms of keeping up with current trends and technical advancements and how they innovate using digital technology, only 48.5% of students rated that they were good at it, while 35.9% indicated that they were poor at it. A good level of creative use of digital technology was then asserted by 56.2% of the students. Similarly, 52.1% rated themselves “good” for participation in events and workshops in digital creation, collaborative multimedia, and digital projects. The results also showed that in terms of identifying gaps 59.2% of respondents were conscious of the need to enhance their digital competence and willing to offer help to others who need to develop theirs.

There are numerous definitions of digital competence, and at present, no one idea is widely confirmed and agreed upon. The understandings and perceptions of scholar and experts mentioned above, however, make it obvious that digital competence which refers to the ability to use ICT with confidence and creativity while

learning, working, relaxing, and playing must be viewed as an essential asset and survival skill in the digital age (Zhao, 2021).

Moreover, it is important to take into account that self-regulation indicates a dynamic psychological functioning that aid learners address more strong controls over their targeted learning behavior, efforts, and strategies in order to fully realize the targeted learning objectives. It is not a static or innate psychological construct.

These findings are congruent with the earlier research conducted by Sahranavard et al. (2018), which find out that students who applied more self-regulating strategies were effective in both self-efficacy and future planning. By managing their emotions and the effects they receive from others, students who has prime cognitive self-regulation can accomplish better academically. They are highly motivated to study and focused on targeted planning. During the early years and across lifespan, self-regulation is crucial for the growth and conservation of health and well-being (Braund, 2021).

The study is anchored on the proposition made by Dweck and Master (2008), Hidi and Ainley (2008), and Zimmerman and Schunk (2011) that a flexible belief of intelligence constantly serves as the inspiration for self-direction in self-regulated learning because it provides the learner a sense of self-efficacy when they modify their learning processes. The view of intelligence makes this approach unique, implying that the learner can control their own understanding of intelligence to achieve the determined criteria. The experience can contribute to getting the desired outcome, whether the person has gained everything they need to know, is still learning, or somewhere in the middle.

The Self-Regulation Learning Theory developed by Zimmerman provides the theoretical foundation for the importance of self-directed learning in the success of online learning. This approach underline on how important for the students to monitor their own learning. Kohan N. et al (2017) proposed that online learners must be self-directed in their planning, analyzing, executing, and assessing of their learning. According to Geng et al. (2019), self-directed students have the ability to be actively involve in their learning and determine efficient learning strategies based on the specific learning situation, such as online learning.

Self-directed learning is the independent variable. A self-directed questionnaire with five indicators was developed by Williamson (2007). These indicators comprise of awareness strategies which were about students of the factors assisting to be self-directed learners; learning strategies which explained the different methods adopted by self-directed learners to be self-directed in their learning processes; learning activities that specified the activities for becoming self-directed in the learning process; evaluation strategies which showed the students particular attributes to help them check their learning activities, and interpersonal skills which were about learner abilities for having a good relationship, necessary to become self-directed learners.

The dependent variable is digital competence. Based on the questionnaire designed and tested by the European Union (Europass) it consists of five main categories; information processing which measures users' ability to 'identify, locate, retrieve, store, organize and analyze digital information, judging its relevance and purpose; communication which refer to the ability to communicate, collaborate, interact with and participate in virtual teams and networks as well as make use of appropriate media, tone and behavior; content creation which refers to developing digital content, integrating and re-elaborating digital content, copyright and licenses, and programming; safety which refers to protecting devices, protecting personal data and privacy, protecting health and well-being, and protecting the environment; and problem solving which refers to solving technical problems, identifying needs and technological responses, creatively using digital technologies, and identifying digital competence gaps.

The mediating variable is self-regulation. According to the self-regulation questionnaire developed by (Brown, Miller, & Lawendowski,1999) there are seven indicators for this variable; receiving relevant

information known as information input (self-observation) is the first process that occurs in self-regulation, where persons obtain information about their own behavior, especially about a potentially problematic behavior; evaluating the information and comparing it to norms which one looks for consistency between expected performance and actual performance, and this includes becoming aware of the negative consequences of a behavior; Triggering change (Instigation to change) is triggered by perceptions of discrepancy and dissatisfaction in the evaluation process; Searching for options as a process in self-regulation aims to reduce discrepancies that have been detected; Formulating a plan, where one sets down a schedule, activities to be pursued, places and any other aspects to be considered in the attainment of one's goals; Implementing the plan, (implementation of behavior change) the stage where one executes all that was planned in the prior phase; Assessing (comprehensive assessment) is the final phase of the seven successive processes of self-regulation, it is a process of addressing both the effectiveness of one's planning and the attainment of goals.

METHOD

This chapter presents the methods and procedures used in this study, including the participants, research instrument, research design, data collection, and statistical tools.

Research Design

The study applied the quantitative, non-experimental design method of research using the correlation technique. The aim of this research is to deliver a credible answer to a research question. Its target was to distinguish attainable traits, including attitudes, behavior, relationships, and achievement. Since the current study deals with self-regulation and the relationship between students' self-directed learning and digital competence, the non-experimental quantitative method is appropriate. Variables are only identified and examined as they happen in a natural setting; they are not controlled or altered (Educational Research, 2011).

Descriptive surveys are effective for confirming information that serves as the foundation for scientific judgment. It contributes substantially to the development of instruments for measuring numerous items, instruments utilized as data collection tools in all forms of quantitative research, and it gives essential information about the nature of people and things. Given that it deals with the description and determination of both independent and dependent variables, the descriptive-correlational survey method is appropriate for the current study (Creswell, 2013).

Population and Sample

The study commenced from March 2023 to April 2023 in Mati City, Mati City Division, Region XI, or, popularly, the city of beautiful bays. This study has a total of 300 student respondents, which were determined through a simple random sampling method.

The grade 11 and 12 TVL senior high school students at Mati School of Arts and Trades, City of Mati Division for the S. 2022–2023 were the respondents to this study. The research site of the respondents was chosen based on a genuine interest or personal connection in the school, which was a good starting point for conducting the study and analysis. The learners reference number was reflected in the school registrar list of officially enrolled senior high school students at Mati School of Arts and Trades. The target population was 300 grade 11 and 12 TVL senior high school students. The respondents were willing to submit themselves and had permission from their parents or guardians to undergo the survey. TVL senior high school students who clearly disagreed with the study were excluded. Moreover, principals, supervisors, teachers, parents, and junior high school students were also excluded from the study.

Research Instrument

The study comprised a three-part questionnaire, one for each variable. The document was validated and revised based on expert recommendations. Prior to conducting the actual survey, the researcher conducted a preliminary survey with 50 respondents for reliability testing. The preliminary data collected undergoes a validity test based on internal consistency using Cronbach's alpha.

Five professional validators were requested to validate the instrument to make it more suitable and reliable and receive an acceptable rating. The instrument was also modified to make it more appropriate for present and local settings.

The respondents of the study gave their opinions on a 5-point Likert-type scale from strongly agree to strongly disagree. Experts validated the questionnaire by highlighting the strong and weak areas. After validation, reliability was calculated.

The first part of the instrument deals with the scale for students on self-regulation (Miller & Brown, 1991). Cronbach's Alpha was applied to check the reliability of the instrument of .818. The questionnaire has 63 items with a 5-point Likert scale for every item.

The second part of the instrument deals with the students self-directed learning. A self-rated scale of self-directed learning (SRSSDL), developed by Williamson (2007), was used for data collection. The instruments include awareness, learning strategies, learning activities, evaluation, and interpersonal skills. There are 108 items with a 5-point Likert scale for every item. The instrument got a reliability of .877 using Cronbach's alpha.

The third questionnaire measures digital competence which focuses on information processing, communication, content creation, safety and problem solving (Olivier, & Hipp, 2010). Cronbach's Alpha was applied to check the reliability of the instrument of .901. The questionnaire has 72 items with a 5-point Likert scale for every item.

The final version was developed before the instrument's administration, accounting for the five (5) experts' mistakes, remarks, and recommendations. Cronbach's alpha was used to test the scales' reliability. The construct validity of the instruments had an overall score of 4.0, indicating that the tools are well-liked. Using the coefficient alpha has the benefit of producing results that are simple to understand. The closer the coefficient alpha gets to 1.0, a scale with better internal consistency, the more reliable it is (Yang & Green, 2022).

The evaluation of self-directed learning, digital competence, and self-regulation involved the consideration of five distinct gradations. Each gradation was assigned a range of means and a corresponding description: 4.20- 5.00 with a descriptive equivalent of *Very High* and interpreted that the item means always manifested; 3.40- 4.19 with a descriptive equivalent of *High*, and analyzed as the item means oftentimes manifested; 2.60- 3.39 described as *Moderate* and the item implies sometimes manifested; 1.80- 2.59 described as *Low* and means that the item implies seldom manifested; and lastly, 1.00- 1.79 described as *Very Low* and interpreted that the item means never manifested.

Data Collection

The researcher first secured approval to conduct a study from DepEd Mati City, Schools Division Superintendent, and to Mati School of Arts and Trades. After securing approval, the researcher coordinated with the class advisers, discussed the survey schedule, and handed the informed consent form to the corresponding students. The researcher was grateful for the support of the class advisers.

The questionnaire was distributed personally to the grade 11 and 12 TVL senior high school students since

face-to-face classes were already implemented during the conduct of the study. The survey was scheduled by section to ensure that there would be 300 responses. The collection of data commenced in the last week of March 2023 and was realized in April 2023. Pearson r was applied to determine the significance of the mediating effect variable. The study evaluated whether students experienced self-regulation, self-directed learning, and digital competence.

Moreover, the researcher followed the protocol evaluations and standard criteria set by the University of Mindanao Ethics Review Committee (UMERC), with certification number 2022-377, to observe complete ethical standards. All through the study, the participants were given independence to voluntarily contribute at no cost to them. In accordance with the Data Privacy Act of 2012, the researcher assured the confidentiality of the participants' personal data. Additionally, the researcher guaranteed that the collected data from the survey questions was accurate and that the references were acknowledged correctly. Generally, the researcher adhered to all ethical standards established by UMERC throughout the study.

RESULT AND DISCUSSION

Presented in this part of the paper are the analysis, findings, and interpretation of the researcher from the acquired data based on the objectives of the study. The sequence of discussions are as follows: level of self-directed learning of grade 11 and 12 TVL senior high school students; level of digital competence; level of self-regulation, the significant relationship between self-directed learning and digital competence; and self-directed learning and self-regulation; self-regulation and digital competence; and the mediation analysis.

Level of Self-Directed Learning

Table 1 presents the average scores for the indicators of self-directed learning; with an overall mean of 3.62 described as high with a standard deviation of 1.05 and a descriptive interpretation of *high*. The high level could be attributed to the equally high rating given by the respondents. This indicates that the level of self-directed learning is oftentimes manifested among grade 11 and 12 TVL senior high school students. The first indicator with the highest mean is evaluation with a mean rating of 3.68 with a descriptive level of high. The second is learning strategies with a mean rating of 3.64. Interpersonal Skills, with a mean rating of 3.55, which is described as high got the lowest mean rating.

Table 1. Level of Self-Directed Learning

Indicators	Standard deviation	Mean	Descriptive Equivalent
Awareness	1.09	3.62	High
Learning Strategies	1.06	3.64	High
Learning activities	1.04	3.62	High
Evaluation	1.04	3.68	High
Interpersonal skills	1.04	3.55	High
Over-all result	1.05	3.62	High

The results imply that the grade 11 and 12 TVL senior high school students are highly initiating their own learning processes. With their level of self-directed learning, these students manifest that they are accountable in their learning growth to achieve academic success. Evaluation, the indicator with the highest mean score, implies that these students diagnose the areas for further development in whatever they have accomplished, monitor learning progress, and identify areas of strength and weaknesses.

Evaluation in academia has a significant impact on various aspects of academic work and student learning

(Walker, 2017). Danquah (2020) further supported this, showing that effective evaluation practices, such as providing feedback and using appropriate techniques, can improve student performance. On the other hand, these students need further advancement in interpersonal skills which they need to learn more about other cultures and languages frequently exposed to, able to identify their role within a group, and interact with others to help develop the insight to plan for further learning. Interpersonal skills are crucial for both teachers and students, as they contribute to a positive learning environment and student growth (Kumari, 2020).

The overall finding supports the study of Tekkol (2018) and Haftum (2020). Students' average SDL scores indicate high self-direction. Tekkol concluded that undergraduate students possessed self-directed learning skills, which are associated with lifelong learning. Self-directed learning (SDL) is a relevant and favored learning process to equip students for lifelong learning in their professions and make them stay current. (Haftum, 2020)

Persky and Robinsons (2020) further explained that self-directed learning can be described as a six-step process: developing goals for study; outlining assessment with respect to how the learner will know when they achieve those goals; identify the structure and sequence of activities; lay out a timeline to complete activities; identify resources to achieve each goal; and locate a mentor/faculty member to provide feedback on the plan.

Level of Digital Competence

Presented in Table 2 are the data on the level of digital competence. Computations yield a grand mean of 3.44 or high with a standard deviation of 1.06 and this indicates that the digital competence of senior high school students is oftentimes manifested. The first indicator with the highest mean is safety, with a mean rating of 3.56, with a descriptive level of high. The second is information processing with a mean rating of 3.47, which is still high. Content creation, with a mean rating of 3.33, which is described as moderate got the lowest mean rating.

Table 2. Level of Digital Competence

Indicators	Standard deviation	Mean	Descriptive Equivalent
Information processing	1.08	3.47	High
Communication	1.07	3.44	High
Content creation	1.03	3.33	Moderate
Safety	1.08	3.56	High
Problem solving.	1.02	3.43	High
Over-all result	1.06	3.44	High

The results imply that the grade 11 and 12 TVL senior high school students display a high level of mastery, adeptness, and approach of their digital competence. The high level of safety indicated that digital competence is manifested among senior high school students in terms of taking basic steps to protect devices (e.g., using anti-viruses and passwords), using different passwords to access equipment, devices and digital services and modifying them on a periodic basic, understanding the positive and negative impact of technology on the environment, and have an informed stance on the impact of digital technologies on everyday life and environment. Furthermore, students showed their positive perceptions in the safety section of digital competence, which showed contrary results to those obtained by Gallego et al., (2019), digital safety scored medium level.

Moreover, the low rating of content creation indicated that the grade 11 and 12 TVL senior high students

need to practice producing simple digital content like text, tables, images, audio files in at least one format using digital tools. Produce complex digital content in different formats and multimedia content in different formats, using a variety of digital tools and environment. Similarly, López-Meneses (2020) identified a lower level of competence in digital content creation, particularly in the creation and dissemination of multimedia content although these results were contrary to those from Bernate et al. (2020) who indicated that students had good levels of creativity and digital innovation for the creation and development of new projects.

The results obtained from this study were similar to the research findings by Zhao et al. (2021), showed that students are good at addressing real-world technical problems. Most students, 58.6 rated themselves as good, which implies that they can identify their needs and provide technical replies. In terms of keeping up with current trends and technical advancements and how they innovate using digital technology, only 48.5% of students rated that they were good at it, while 35.9% indicated that they were poor at it. A good level of creative use of digital technology was then asserted by 56.2% of the students. Similarly, 52.1% rated themselves “good” for participation in events and workshops in digital creation, collaborative multimedia, and digital projects. The results also showed that in terms of identifying gaps 59.2% of respondents were conscious of the need to enhance their digital competence and willing to offer help to others who need to develop theirs.

Digital competence is associated with the knowledge, ability, and perspective of using digital technologies for creating information for learning, evaluating, and participating and communicating with others for learning purposes (He & Li, 2019). Fostering university students’ digital competence is essential for their advancement in higher education (López-Meneses et al., 2020).

Level of Self-Regulation

Presented in Table 3 are the mean scores for the indicators of self-regulations of students with an overall mean of 3.43 described as High with a standard deviation of 1.20. This indicates that the level of self-regulation is oftentimes manifested. The high level of self-regulations of students is due to high level given by the respondents in formulating a plan with a mean score of 3.62, next is searching with mean score of 3.47, evaluating and assessing with a mean score of 3.46. However, implementing got a mean score of 3.29 which is described as moderate.

Level of Self-Regulation

Table 3. Level of Self-regulation

Indicators	Standard deviation	Mean	Descriptive Equivalent
Receiving	1.23	3.34	Moderate
Evaluating	1.18	3.46	High
Triggering	1.2	3.39	Moderate
Searching	1.27	3.47	High
Formulating	1.12	3.62	High
Implementing	1.11	3.29	Moderate
Assessing	1.24	3.46	High
Over-all result	1.20	3.43	High

The results imply that the grade 11 and 12 TVL senior high school students were able to manage their behavior and motivation and apply metacognitive skills to achieve their learning goals. The high level of

formulating a plan implies that when it comes to deciding about a change, students feel overwhelmed by the choices, can come up with lots of ways to change, but it’s hard for them to decide which one to use, have a hard time setting goals for themselves, have trouble making plans to help reach their goals, and usually think before they act.

Formulating a plan is a process of drafting a timetable, activities to follow, places, and any other factors to be considered in achieving one’s goals (Miller & Brown, 1991). Achieving success in the classroom, the workplace, and in life in general can be attained by setting and completing goals. Establishing high yet well-defined goals is among the most effectual management strategies for increasing output and motivation (Hopfner, 2021).

These results were congruent with the earlier research conducted by Sahranavard et al. (2018), which find out that students who applied more self-regulating strategies were effective in both self-efficacy and future planning. By managing their emotions and the effects they receive from others, students who has prime cognitive self-regulation can accomplish better academically. They are highly motivated to study and focused on targeted planning. During the early years and across lifespan, self-regulation is crucial for the growth and conservation of health and well-being (Braund, 2021).

Moreover, the findings displayed moderate result in implementing plan by the grade 11 and 12 TVL senior high school students in terms of getting easily distracted from their plans, having trouble following through with things once they have made up their mind to do something, having a lot of willpower, able to resist temptation, and giving up quickly. Implementation intentions supports the individual to proceed from the intent (setting the goal) to the actions necessary for reaching the desired state. They usually take the form in which they address the potential to apply planned appropriate activities in the case of a suitable situation occurring (Brand stätter & Hennecke, 2018).

Furthermore, a moderate level of self-regulated learning was revealed by Mukti (2022) that focused on attention, self-awareness, planning, evaluation, and enthusiasm. Kartasheva (2021) examined more carefully the unconscious regulation of psychological states, emphasizing the role of reflection, metacognitive abilities, intellect, and the cognitive ability to self-regulate.

Correlation between Self-Directed Learning, Digital Competence, and Self-Regulation

In Table 4 is the relationship between the independent (self-directed learning), dependent (digital competence), and mediator (self-regulation) variables.

Correlation Analysis of the Variables

Table 4. Significance Relationship between Self-Directed Learning, Digital Competence and Self-Regulation

Pair	Variables	Correlation Coefficient	p-value	Decision
IV and DV	Self-directed learning and digital competence	.006	0.913	Not Rejected
IV and MV	Self-directed learning and self-regulation	.266**	0.000	Reject
MV and DV	Self-regulation and digital competence	-.004	0.947	Not Rejected

The relationship among the variables was determined using a bivariate correlation analysis with Pearson product-moment correlation. The results of the computations are shown in Table 4. The first zero-ordered correlation analysis between self-directed learning and digital competence revealed a computed r-value of .06 with a probability value of p= 0.913 which is not significant at the 0.05 level. This indicates that there exists a very weak association between the two variables (Evans, 2002) and that the existence of possible

relationship is null. Thus, the null hypothesis of no significant relationship is not rejected, and that self-directed learning and digital competence may be independent and non-associated variables of their own.

These finding is contrary to the previous studies that shows a positive correlation between self-directed learning and digital competence. Popa (2018) found that students with higher levels of self-directed learning tend to use digital tools more frequently, while Muñoz (2021) highlighted the role of teacher collaboration in enhancing students' digital competence. Morris (2021) and Morris (2019) both underscore the importance of digital technology in supporting self-directed learning, particularly in formal education. These findings collectively suggest that self-directed learning and digital competence are mutually reinforcing, with the former driving the effective use of digital tools and the latter enhancing the ability to engage in self-directed learning.

The second bivariate correlation analysis involving Self-directed learning and self-regulation yielded an r-value of .266 with a probability value of $p < 0.000$, which is significant at 0.05 level. It can be seen as showing a favorable relationship between the two variables. Since the null hypothesis is rejected, the idea that there is no meaningful link is likewise disproved.

These results were consistent with similar research by Ruswana and Zamnah (2019), who revealed that self-directed learning methods influence the advancement of self-regulated learning and self-confidence in students. In the preceding study by Hwang and Oh (2021), self-regulated learning was also significant between self-directed learning and critical thinking skills. The result suggested that self-regulated learning can help build up nursing students' capability to manage their learning environment and solve problems. Linkous (2021) concluded that self-directed learning and self-regulation are two distinct areas in which a learner executes and produces an effective learning arena to achieve a singular goal for educational purposes.

The third correlational analysis between self-regulation and digital competence yielded an r-value of -.004 with a probability value of $p = 0.947$, which is not significant at 0.05 level. This indicates that there is no favorable relationship between the two variables. Since the null hypothesis is not rejected, the idea that there is no meaningful link is likewise accepted.

These results are incongruent with the study by Demes hkant et al. (2020), who revealed that self-regulated students are more knowledgeable and have an average level of digital competences, both in pedagogical as well as technological knowledge, and that by Santos et al. (2021), who proved that students' self-regulation influences academic achievement in directing, monitoring, and regulating their behaviors during the entire education process. Similarly, Hamdan et al. (2021) asserted that higher self-regulation results in higher contentment in online learning. In a recent study, Landrum (2020) claimed that one of the strongest positive predictors of satisfaction is self-regulation.

Mediation Analysis of the Three Variables

Data were analyzed with linear regression method as input to the medgraph. Mediation analysis developed by Baron and Kenny (2001) is the mediating effect of a third variable in the relationship between two variables.

There are four steps to be met for a third variable to be acting as a mediator. In Table 5, these are categorized as steps 1 to 4. In step 1, self-directed learning as the independent variable (IV) non significantly predicts digital competence of grade 11 and 12 TVL senior high school students, the study's dependent variable (DV). In step 2, self-directed learning significantly predicts self-regulation, the mediator (M). In step 3, self-regulation non significantly predicts digital competence of students.

Table 5. Regression Results of the Variables in the Four Criteria of the Presence of Mediating Effect

STEP	PATH	BETA (UNSTANDARDIZED)	STANDARD ERROR	BETA (STANDARDIZED)
Step 1	c	.020	.183	.006
Step 2	a	.262	.055	.266
Step 3	b	-.019	.193	-.006
Step 4	c'	.025	.190	.008

Further mediation analysis through med graph is warranted, involving the Sobel z test to assess the significance of the mediation effect. If the effect of the independent variable on the dependent variable becomes non-significant at the final step of the analysis, complete mediation will be achieved. It means the mediator variable mediates all the effects. It also indicates that, while some of the effects are mediated by the mediator, some are either direct or mediated by other factors not included in the model. In this case, as gleaned in step 4 (denoted as c'), the effect of self-directed learning on digital competence did not increase after mediated by self-regulation. Since there is no relationship between IV (self-directed learning) and DV (digital competence) it follows that there is no mediating effect of MV (self-regulation) to the relationship between IV and DV.

Furthermore, the result of the computation of mediating effects is shown in Figure 3. The Sobel test yielded a z-value of -0.098 with a p-value of 0.921595, which is not significant at 0.05 level. This means that mediating effect is non significant, such that the original direct effect of self-directed learning on digital competence did not increase even after the addition of self-regulation. The negative value of Sobel z indicates that the addition of self-regulation does not reduce, but somewhat improves the effect of self-directed learning on digital competence.

The figure also shows the results of the computation of the effect size in the mediation test conducted between the three variables. The effect size measures how much of the effect of self-directed learning on digital competence can be attributed to the indirect path. The total effect value of 0.020 is the beta of self-directed learning towards digital competence. The direct effect value of 0.025 is the beta of self-directed learning towards digital competence with self-regulation included in the regression. The indirect effect value of -0.005 is the amount of the original beta between the self-directed learning and digital competence that now goes through self-regulation to digital competence ($a * b$, where "a" refers to the path between SDL à DC, and "b" refers to the path between SR à DC).

The ratio index is computed by dividing the indirect effect by the total effect; in this case, -0.005 by 0.025 equals -0.251. It seems that about -25.1 percent of the total effect of self-directed learning on digital competence goes through self-regulation, and about 74.9 percent of the total effect is either direct or mediated by other variables not included in the model.

Based on the results, self-directed learning non-significantly mediates digital competence. The relationship between self-directed learning and digital competence is complex and multifaceted. Research has consistently shown a positive relationship between self-directed learning and digital competence in students. Karatas & Zeybek, 2020; Morris, 2019 highlighted that self-directed learning is a crucial competence for everyone living in our modern world, where social contextual conditions are changing quickly, particularly in a digital age. Most of the time, self-directed learners are more engaged in learning activities, such as reading online learning materials, planning, and evaluating learning accomplishment (Geng et al. 2019). These findings collectively suggest that self-directed learning plays a mediating role in the development of students' digital competence. However, Şumuer (2017) and He (2017) both identified significant mediating factors in this relationship, with the use of Web 2.0 tools for learning mediating the impact of online communication and computer self-efficacy on self-directed learning with technology, and personal innovativeness and digital competence being mediated by attitude to digital informal learning.

These findings imply that while self-directed learning may have a part in the progress of digital competence, it is not the single determining factor.

Moreover, A range of studies have explored the development of digital competence in students. Pöntinen (2020) emphasizes the importance of a holistic, long-term approach to fostering digital competence in young students, while Sánchez-Caballé (2020) underscores the need for educational institutions to support the development of this competence. Kuzminska (2018) and Nowak (2019) both highlight the role of teachers in this process, with Kuzminska focusing on the digital competence of both teachers and students and Nowak discussing the development of digital competences in teacher training studies. These studies collectively underscore the importance of a comprehensive, sustained effort to develop digital competence in students, with a particular emphasis on the role of teachers and educational institutions.

Research has shown that self-directed learning can significantly impact students' self-regulation. Bednall (2011) found that the use of instructional aids, such as planning and the generation of explanations, can improve self-regulation in self-directed study. This is supported by Virtanen (2017), who found that active learning methods, which are often used in self-directed learning, are positively related to the achievement of professional competences. However, Voskamp (2020) highlights the challenge of integrating self-directed learning into teaching practices, suggesting that the definition and methods used to enhance self-directed learning can vary. Therefore, while self-directed learning can enhance self-regulation, it is important to consider the specific strategies and methods used in its implementation.

Lastly, self-regulation non-significantly mediates digital competence. The findings concur with the study of Zhao (2021) who found no significant mediating effect of self-regulation on digital competence, suggesting that the relationship between these variables may be more complex and context dependent. Further research is needed to clarify the role of self-regulation in the development of digital competence in students.

CONCLUSION AND RECOMMENDATIONS

The study revealed that the overall self-directed learning is high, which means that the self-directed learning, as perceived by the grade 11 and 12 TVL senior high school students are good. The results further showed that all the indicators of self-directed learning: awareness, learning strategies, learning activities, evaluation and interpersonal skills were always practiced. The study revealed that the overall digital competence of grade 11 and 12 TVL senior high school students is high, which means that the digital competence, as perceived by the senior high school students, are good. The results further showed that among the indicators of digital competence, information processing, communication, safety, and problem solving were always practiced. Lastly, the study revealed that the overall self-regulation skills of students are high, which means that the self-regulation, as perceived by the grade 11 and 12 TVL senior high school students, are good. The results further showed that among the indicators of self-regulation, evaluating, searching, formulating, and assessing were always practiced.

The result further discussed that even though the three variables self-directed learning, digital competence and self-regulation got high ratings, not all these three variables have significant relationship with one another. Thus, the result disproves the theoretical underpinnings of the study.

The researcher came up with recommendations based on the results of the study. Since the result showed that the self-regulation, self-directed learning, and digital competence of senior high school students are high, except for the indicators with a descriptive equivalent of moderate which is the content creation with a mean of 3.33, receiving with a mean of 3.34, triggering with a mean of 3.39 and implementing with a mean of 3.29. It is recommended to develop or enhance their content creation skills by practicing regularly. Whether producing simple digital content like text, images, audio, and video filed using digital tools. Extensive reading of books, journals, newsletter, and other reading materials that are related to content creation would help widen the knowledge, ideas, views and techniques of students in content creation. The

faculty and school administrator may provide opportunities for students to perform vital digital skills through hands-on activities and exercises where students can actively explore with digital tools, software applications, programming, and online resources. Integrating digital tools and resources in the curriculum may develop their confidence and enhance their digital competence that will prepare them for the demands of the modern world.

In addition, students may enhance their receiving skills, which means receiving relevant information known as information input (self-observation). Students must be self-aware by reflecting on what they have become, their values and their traits. Keeping a journal to track their progress towards their goal and letting go of the usual doing will help students to enhance their receiving skills. Moreover, students may enhance their triggering skills or instigation to change by writing their goals, it will serve as a reminder to the students of the negative habits they want to eliminate and good habits they want to build for themselves. Lastly, grade 11 and 12 TVL senior high school students may enhance their implementing skills by making a schedule or to-do list. This would help students to organize, manage and track their plans. This would also improve their concentration. Breaking down large task to small task would avoid procrastination among students.

Lastly, the result revealed that self-directed learning and digital competence as well as self-regulation and digital competence do not have any significant relationship with one another. However, result revealed that self-directed learning and self-regulation has significant relationship with one another, it is therefore recommended to conduct another survey about the competence of grade 11 and 12 TVL senior high school students in different schools of the Division of City of Mati, through the school heads by assessing the self-directed learning, digital competence and self-regulation of students through TVL teachers.

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