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FOSTERING SELF-REGULATION AND LIFE SCIENCE-TECHNICAL-VOCATIONAL INTEGRATED SKILLSTHROUGH CAREER-FOCUSED TEACHING

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ABSTRACT

This study investigated the effects of Career-Focused Teaching (CFT) on students' self-regulation and life science-technical-vocational integrated skills in Biology. It also aimed to find out whether self-regulation is a positive predictor of life science-technical-vocational-integrated skills. Two intact heterogenous classes from a public Senior High School were involved in the study. The classes were randomly assigned to either the conventional group (Science Conventional Teaching) or the experimental group (Career-Focused Teaching). The revised Self-Regulation Questionnaire and the researcher-made Life Science-Technical-Vocational Integrated Skills Questionnaire were the instruments used in the study to measure students' self-regulation and life science-technical-vocational integrated skills in Life Science, respectively. The results from statistical analysis revealed that CFT is effective in fostering students' self-regulation and life science-technical-vocational integrated skills in Biology. The results also revealed that self-regulation is a significant predictor of life science-technical-vocational integrated skills.

Keywords: *Biology,Career-Focused Teaching, Self-Regulation, Life Science-Technical-Vocational Integrated Skills*

INTRODUCTION

The Philippine News Agency (PNA) reported in 2018 that 38% of the 1.2 million Senior High School (SHS) students who finished the track chose to seek employment after graduation but only 28% of them were hired and became members of the labor force. This number seems to be lower than what is expected of TVL graduates in spite of work immersion or on-the-job training as one of the requirements in SHS (Montemayor, 2018). With TVL track, students are expected to be trained and equipped with career skills in specialized subjects (e.g., Earth and Life Science) to become job ready. However, in the core subjects (e.g., Earth and Life Science), teaching is focused on concept formation rather than on skills demonstration and attainment of learning competencies, thus, students graduate without proficiency in the specialized subjects (Fisher & Frey, 2001).

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Likewise, studies conducted in the Netherlands and other Western countries revealed that students in vocational education are being trained to exhibit high academic achievement rather than meet the competencies needed for their careers. This condition therefore, produces graduates who are not competent with the skills in their field of specialization (Draaisma, Meijers, &Kuijpers, 2017).

Moreover, a study conducted in the Philippines found out that students' job readiness is dependent on various employability skills such as critical thinking, problem solving, and teamwork. Hence, without these skills, their chances of getting employed are low (Abas & Imam, 2016). Similarly, the increasing rate of job mismatch in the Philippines is because of the education-occupation mismatch where students only receive training and skills development from specialized subjects and not from the core subjects (Jasa, Jasa, &Corpuz, 2013).

Career-focused teaching (CFT) approach provides the avenue for students to focus on one career field in which they are most interested. The K to 12 curriculum should generally contain content that is directly related to that area of study and focuses on essential theory and students' practical skills (Kim, 2013). On that note, the aim of this research is to incorporate CFT in the teaching of Life Science in Senior High School.

This study aims to give students an opportunity to apply their practical skills even in the core subject's class such as Science. For linked learning to happen, students must apply the skills they use during specialized subjects. According to Shukla (2015), there are four skills that Life Science and technical-vocational-livelihood have in common. These are metacognitive, communication, collaborative, and problem-solving skills. These skills honed in the classroom through CFT, give students an opportunity to master skills on both core and specialized subjects since the teaching-and-learning process is contextualized. In addition, a study proves that students develop a strong content knowledge in specialized subjects if they are provided with authentic learning practices (Attia, 2017). In addition, self-regulated learning is considered to be a key strategy for promoting employability among students (Rowe &Zegwaard, 2017).

These premises motivated the researcher to seek for answers to the following questions:

1. Do students exposed to CFT have better self- regulation as compared to students exposed to science conventional teaching (SCT) approach?
2. Do students exposed to CFT have better life science-technical-vocational integrated skills as compared to students exposed to science conventional teaching (SCT) approach?
3. Is self-regulation a positive predictor of life science-technical-vocational integrated skills when students are exposed to CFT?

REVIEW OF LITERATURE

Technical-Vocational-Livelihood Track in K-12 Program

The TVL track originated from the Technical and Vocational Education and Training (TVET) pioneered by the United Nations Educational, Scientific and Cultural Organization (UNESCO) to provide employment opportunities for young individuals and to re-train workers (Wheeler, 2017). However, challenges arose in the implementation of the K to 12 program and the inclusion of TVL track in several schools in Nigeria. These challenges were (1) lack of facilities; (2) poor funding programs; (3) poor teaching methods; and (4) poor assessment of students' competency (Ayonmike, Okwelle, & Okeke, 2015). On the other hand, in a study conducted in Palestine, it was shown that the TVET curriculum has certain empowerment effects on its graduates (the learners) through the integration of sustainable development into learning contents and school policies and practices (Paryono, 2017).

Career-Focused Teaching

Career-focused instruction is the educational framework which enables students to connect

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curriculum content and learning experiences to the world of work. With this, career-technical teachers are provided with sample instructional units for them to integrate career-focused instruction in real classrooms in the secondary level. These career-focused instructional units embedded in the lessons are: objectives; procedures; assignment(s); activities; career extension; handouts; assessment; and resources (Ohio State Dept. of Education, 2001). In California, an attempt was made by public secondary school teachers to blend academics with career-focused instruction in reforming the education curriculum. This was based from the improved results of students' achievement when classroom instruction was connected to the real world of work. Moreover, with its result, teachers and principals concluded that career-focused instruction really opens more opportunities to students (Armistead & Education Partnerships, 2010). Thus, career and technical education (CTE) programs as included in the curriculum in postsecondary education level help improve academic and occupational skills of students (Shipp, 2016). With this, career-focused bachelor's degree programs were offered in Wentworth Institute of Technology, Boston in areas such as applied mathematics, architecture, and business management since university administrators believed that this approach provides opportunities for students to look for jobs after college (Galeno, 2017).

Knowledge Products

Knowledge products are students' tangible outputs resulting from project-based assessments wherein they applied their conceptual understanding and the skills developed in a certain lesson. In the marketing industry, knowledge products ensure and provide perpetual learning for a prolific, globally competitive workforce within a dynamic educational environment (Glessner& Gillis, 2012). In the same way, in the agricultural system, knowledge product (KP) is one of the contributing factors in achieving the system's goal on sustainable food security. So, it is imperative that knowledge products must be integrated in the curriculum so that even at a young age, students know how to transfer their skills and learn to do something useful to their career and for the community (Antle, et al., 2017).

Self-Regulation in Life Science and Technical-Vocational Education

Self-regulated learning was also found necessary for TVET, together with critical thinking skills. Students in TVET are said to apply and demonstrate competencies in the specialized subjects if the critical thinking and self-regulation skills are high (Ab.Hadi, Hassan, Abdul, & Mustafa, 2015). Besides, self-regulated learning helped in skills development, employment, and sustained growth of workers in Ghana (Palmer, 2009). Another study proposes that since work industry posts changing demands, high self-regulation is essential for students especially when they undergo competency-based trainings to make a positive effect on their career skills (Boahin & Hofman, 2014).

Life Science-Technical-Vocational Integrated Skills

In Thailand, 60% of students enrolled in vocational programs that are focused on science and technology tracks show low test scores. With this result, a needs assessment study was conducted, and it showed that the skills needed to be improved are experimenting, formulating hypotheses, interpreting, making inferences, identifying, and controlling variables and defining them operationally – which are the science integrated process skills. The skills can be enriched through authentic performance (Sermsirikarnjana, Kiddee, &Pupat, 2017). Also, according to Sermsirikarnjana, Kiddee, andPupat (2017), vocational education and science instruction must focus on the practical or applied nature of science. The applied nature of science involves the basic and integrated science process skills. They also added that vocational science teaching process must emphasize problem-solving and decision-making skill mastery among students since these skills are significant in the career industry.

METHODOLOGY

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The study utilized a quasi-experimental method following pretest-posttest non-equivalent group design which involved two intact classes of Grade 11 Animation students. Each class was randomly assigned to either the experimental or the conventional group. Pretest and posttest on self-regulation and life science-technical-vocational integrated skills were administered before and after the intervention, respectively.

The study was conducted in a public Senior High School located in Makati City. Each class is composed of 35 heterogeneously grouped students. This research adopted an existing and validated research instrument to measure students' self-regulation and a researcher-made instrument to measure respondents' life science-technical-vocational integrated skills. The Self-Regulation Questionnaire (SRQ) consists of 27 items which was used in the Czech Republic that measures how students proactively apply self-directive processes, cognitive behaviors, and emotions to accomplish goals, acquire skills, and cope with emotional reactions (Gavora, Jakešová, & Kalenda, 2015) The tool has four categories (impulse control, goal orientation, self-direction, and decision making) and attained a test-retest reliability of 0.81 after being pilot tested. To assess students' employability skills (metacognitive skills, communication skills, problem-solving skills, and collaboration skills) from both science and TVET as identified by Shukla (2015), Life Science-Technical-Vocational Integrated Skills Questionnaire (LSTVISQ), a 29-item instrument, was made by the researcher and attained a test-retest reliability of 0.89 after being pilot tested. The said pilot testing of both instruments was done to ensure that the instruments are appropriate for Filipino students.

During the intervention, two teaching approaches were utilized in the study – Career-Focused Teaching (CFT) and Science Conventional Teaching (SCT). The lessons in Life Science in both groups were developed using the 5 Es (Engage, Explore, Explain, Elaborate, and Evaluate) learning framework. The intervention took seven learning cycles which covered seven weeks focusing on the seven topics under Grade 11 Earth and Life Science which are as follows: (1) Introduction to Life Science; (2) Bioenergetics; (3) Perpetuation of Life; (4) How Animals Survive?; (5) How Plants Survive?; (6) The Process of Evolution; and (7) Interaction and Interdependence. For CFT, students were exposed to various inquiry-based learning activities (e.g., jigsaw technique, metaphors/analogies, experiment, simulation, thinking maps, context-based learning, peer-to-peer teaching, debate, and the like) in every learning cycle to enhance their self-regulation toward learning Life Science. After every learning cycle, students came up with various outputs of knowledge products (e.g., comic strip, digital and hand-drawn posters, info graphics, cartoons, and the like) to provide them opportunities to integrate and practice technical-vocational skills and life science skills. On the other hand, for the SCT group, the teaching and learning activities were not parallel to CFT-exposed group and students did not have similar CFT-guided skills and outputs. For instance, in the topic 'Introduction to Life Science', the learners were expected to come up with an output that shows how they value life by taking good care of all beings, humans, plants, and animals such as role playing. Therefore, the outputs expected were those that are suggested in the DepEd curriculum guide for Earth and Life Science.

Quantitative and qualitative methods were employed on the analysis of data collected from the instruments and students' journal entries. For the qualitative data analysis, a thematic analysis was used to analyze students' written reflective journals to support the quantitative results of the study.

RESULTS AND DISCUSSION

Initial Comparability in Students' Self-Regulation

To establish the initial comparability of the two groups' self-regulation, the mean pretest ratings were subjected to a two-tailed independent samples *t*-test. The results of the *t* statistics showed

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that there was no statistically significant difference in the mean ratings of the CFT and SCT groups in the SRQ pretest, $t(69) = 2.032$, $p = 0.092$. These results indicate that CFT and SCT groups were initially comparable before the intervention.

Effects of Teaching Approach on Students' Self-Regulation

The results of one-tailed independent samples t-test (see Table 1) showed that there was a significant difference in the overall mean posttest scores: $t(68)= 1.677$, $p = 0.000$, and in all the subcomponents of the SRQ: (a) decision making, $t(68) = 1.675$, $p = 0.000$; (b) goal orientation, $t(68) = 1.671$, $p = 0.000$; (c) impulse control, $t(68) = 1.674$, $p = 0.000$; and (d) self-direction, $t(68) = 1.673$, $p = 0.000$ in the students' self-regulation of CFT group and SCT group. These results suggest that career-focused teaching significantly improves students' self-regulation in learning Life Science.

Table 1. ***CFT and SCT Descriptive Statistics and t-Test Posttest Scores in SRQ***

Sub-component	Group	Mean	SD	SE	*t*	Sig. (1-tailed)
Overall	CFT	3.503	0.078	0.013	1.677	0.000*
	SCT	2.974	0.162	0.027		
Decision making	CFT	3.527	0.179	0.030	1.675	0.000*
	SCT	3.016	0.344	0.058		
Goal orientation	CFT	3.497	0.267	0.045	1.671	0.000*
	SCT	2.954	0.394	0.067		
Impulse control	CFT	3.546	0.174	0.029	1.674	0.000*
	SCT	2.954	0.308	0.052		
Self-direction	CFT	3.441	0.197	0.033	1.673	0.000*
	SCT	2.971	0.336	0.057		

*N = 35 on each group; SRQ Maximum Mean Rating = 4.0; * indicates $p < 0.05$; df = 68*

As supported by qualitative data derived from the written reflection journals of the students on both CFT and SCT group, the following results were interpreted for every sub-component (e.g., decision making, goal orientation, impulse control, and self-direction) of the self-regulation of students toward Life Science.

Students in the CFT group showed greater interest in the subject, Life Science, as compared with the SCT group. This is due to the incorporation of various learner-centered activities such as simulations, role plays, debate, laboratory work and the like.

It was observed that when the students performed those activities, they tend to have good time management because they made sure to finish the task at a given time frame without sacrificing the quality of their output. Therefore, as supported by a study, self-regulated learning activities improve students' time management and lessen any traditional or active forms of procrastinations (Wolters, Won, & Hussain, 2017).

Also, it was observed that during the intervention, students exposed to CFT have the ability to quickly select the most efficient problem-solving strategies during laboratory activities and other problem-based activities since those activities were related to real-life experience. This observation checks with the findings of Baars, Leopold, and Paas (2018) that self-regulation is honed when learners are exposed to problems that they can relate with.

In addition, it was also noted that students in CFT tend to have the ability to actively monitor emotional states such as frustration if they encounter mistake in doing a task and they see to it that they learn from the mistakes committed for them to be able to come up with the correct output. This finding is consistent with the results of the study of Arslan (2018), which shows that self-regulation as mediated by critical thinking ability has a positive relationship to social emotional learning. This means that when students can self-regulate their learning styles, they can manage their emotions, build healthy relationships, and make decisions using the learning domains – knowledge, attitudes, and skills.

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This would imply that in order for CFT to become effective in teaching Life Science, educators must use concrete or real-life examples when giving problem-based tasks to students. The consistent practice of time management seemed to be an important factor as this is one of the demands to workers in the industry. Also, with CFT, students can learn to self-regulate emotions and is balanced with academic ability when doing activities in the classroom. This is because in the world of work, most workers nowadays are trained to develop their cognitive ability and give less focus on the emotional ability; thus, making them show low tolerance to pressure and stress brought about by their jobs.

The inclusion of various inquiry-based learning activities promoted self-regulation among the CFT-exposed students more than the SCT-exposed students who were taught to lecture discussions and question prompts.

Initial Comparability in Students' Life Science-Technical-Vocational Integrated Skills

To establish the initial comparability of the two groups' life science-technical-vocational integrated skills, the mean pretest ratings were subjected to a two-tailed independent samples t-test. The results of the t statistics showed that there was no statistically significant difference in the mean ratings of the CFT and SCT in the LSTVISQ pretest, t(68) = 1.691, p = 0.951. These results indicate that both groups, CFT and SCT, were initially comparable in terms of their life science-technical-vocational-integrated skills. Thus, both groups exhibited similar level of life science-technical-vocational-integrated skills before the implementation of the research intervention.

Effects of Teaching Approach in Students' Life Science-Technical-Vocational Integrated Skills

The results of one-tailed independent samples *t*-test (see Table 2) showed that there was a significant difference in the overall mean posttest scores: $t(68)= 1.668$, $p = 0.000$, and in all the subcomponents of the LSTVISQ: (a) metacognitive skills, $t(68) = 1.659$, $p = 0.000$; (b) communication skills, $t(68) = 1.568$, $p = 0.000$; (c) problem-solving skills, $t(68) = 1.651$, $p = 0.000$; and (d) collaboration skills, $t(68) = 1.673$, $p = 0.000$ in the students' life science-technical-vocational integrated skills of the CFT group and the SCT group. These results suggest that career-focused teaching significantly improves students' life science-technical-vocational integrated skills.

Table 2. ***CFT and SCT Descriptive Statistics and t-Test Posttest Scores in LSTVISQ***

Sub-component	Group	Mean	SD	SE	*t*	Sig. (1-tailed)
Overall	CFT	3.463	0.154	0.026	1.668	0.000*
	SCT	2.965	0.283	0.048		
Metacognitive skills	CFT	3.539	0.218	0.037	1.659	0.000*
	SCT	3.032	0.387	0.065		
Communication skills	CFT	3.294	0.254	0.043	1.568	0.000*
	SCT	2.984	0.395	0.067		
Problem-solving skills	CFT	3.396	0.235	0.040	1.554	0.000*
	SCT	2.902	0.401	0.068		
Collaboration skills	CFT	3.624	0.193	0.033	1.651	0.000*
	SCT	2.943	0.434	0.073		

*N = 35 on each group; LSTVISQ Maximum Mean Rating = 4.0; * indicates p < 0.05; df = 68*

As supported by qualitative data derived from the written reflection journals of the students on both CFT and SCT group, the following results were interpreted for every sub-component (e.g., metacognitive skills, communication skills, problem-solving skills, and collaboration skills) of students' life science-technical-vocational integrated skills.

As shown by the results, Career-Focused Teaching fostered the life science-technical-vocational integrated skills of Senior High School animation students more than those exposed to Science Conventional Teaching.

Based on literature, metacognition among students can be improved through the use of

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problem-based learning opportunities. With this, students would develop learners' reasoning in solving problems (Haryani, 2018). Similarly, focused social collaboration and the reflective prompting incorporated in the intervention acted as promoters of metacognition development (Santiago, Cooper, & Stevens, 2011).

Team-based learning (TBL) opportunities are said to be effective ways to develop students' collaboration toward learning science. TBL utilizes aspecific sequence of individual work, group work, and immediate feedback to create a motivational framework in which students increasingly hold each otheraccountable for coming to class prepared and contributing to discussion (Styron, 2014). Correspondingly, teamwork poses outcomes that would impact learners' social interdependence, conflict resolution, introduction of new ideas, sharing of resources, task division, and communication among learners (McEwan, 2017). Furthermore, teamwork and collaboration helped the students build self-esteem, confidence, and interpersonal and conflict management skills, as well as leadership skills which are essential for employability (Akindele, 2012)

Students exposed to realistic problem-solving approach showed better improvement on problem-solving ability as compared to those learners exposed to the conventional approach (Saleh &Sabandar, 2017). Likewise, context-based problem-solving activities showed enhancement on students' performance and conceptual understanding in Biology (Yu, Fan, & Lin, 2015).

On the basis of the results of this study, incorporation of context-based learning activities in core subjects such as Earth and Life Science in Senior High School should be considered in revisiting the curriculum. Career-focused teaching should be considered and incorporated in the curriculum to provide opportunities to SHS students to apply and practice the competencies necessary for them to master even if they are in the core subject. To provide these opportunities to students, teachers should require knowledge products and outputs to be done by the learners in which they can practice the competencies they have in the specialized subjects even in the core subject.

Lastly, a support from the administration is imperative to be provided to the teachers to realize the inclusion of Career-Focused Teaching in teaching science, such as Biology, since the results of this study show significant improvement on the students' life science-technical-vocational integrated skills.

Self-Regulation as a Predictor of Life Science-Technical-Vocational Integrated Skills

The posttest mean scores in the students' life science-technical-vocational integrated skills were subjected to simple linear regression with students' self-regulation posttest mean scores as the predictor variable. In Table 3.1, the adjusted R square value is 0.485, which means that 48.5% in the LSTVISQ posttest score can be explained by self-regulation.

TABLE 3.1 REGRESSION STATISTICS

Model	R	R^2	Adjusted R^2	SE
1	0.696	0.485	0.469	0.062

Note. N = 35

TABLE 3.2 ANOVA RESULTS

Model		Sum of Squares	*df*	Mean Square	F	Sig.
1	Regression	419.539	1	419.539	13037.341	0.000*
	Residual	1.094	34	0.032		
	Total	420.633	35			

*Note. * indicates p < 0.05*

TABLE 3.3: LINEAR REGRESSION VALUES OF CONSTANT AND SELF-REGULATION

Model		Coefficients	SE	*t*	Sig.

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1	(Constant)	0.920	0.479	1.922	0.063
2	Self-Regulation	0.762	0.137	5.572	0.000*

*Note. * indicates p < 0.05*

The result of the analysis of variance (see Table 3.2) indicates that the regression model is statistically significant (p= 0.000) which suggests that self-regulation is a significant positive predictor of life science-technical-vocational-integrated skills.

Evidences confirm that as the self-regulation of students exposed to CFT activities is improved, their life science-technical-vocational integrated skills are improved as well. Specifically, when the activities given to students were relevant to their experiences and field during experiments, simulations, story-telling techniques their self-direction, goal orientation, and decision making which are part of self-regulation were developed. When these factors of self-regulation were developed among the students, their problem-solving skills and collaboration skills which are part of life science-technical-vocational integrated skills are developed as well. With these, they can solve problems during experiments since they follow the steps of the scientific method. At the same time, collaboration skills were fostered since students know how to solicit and filter helpful ideas which can help them finish the task better than when they do it independently.

In the same way, when students exposed to CFT were given impulse managing activities such as debate, Jigsaw technique, and reflective writing their metacognitive skills and communication skills were improved. It was observed that during debates, students tend to control their emotions when giving arguments and when doing rebuttals. With the use of journal writing, students can reflect the things and ways on how they learn the particular concept. In addition, they can reflect also on the things that they find difficult and they would suggest ways on how can they better understand the subject matter.

Furthermore, since the activities given to students exposed to CFT were relevant to their experiences and specialization as animation students, they have the opportunity to apply their animation skills in creating knowledge products. With this, students have opportunities to master their skills in animation. Therefore, they have an opportunity to perform and practice their animation skills even if they are in the life science class. Moreover, to ensure that the students exposed to CFT would have an improved self-regulation that would also predict improvement on their life science-technical-vocational integrated skills, strategies and activities must be directly related to that area of study and focus on career essential theory and practical skills of students. This allows the students to improve job-related skills focusing on the one career field in which they are most interested. Thus, CFT provides an opportunity for TVL students to apply the skills in the specialized subjects even in the core subjects.

CONCLUSIONS

Career-Focused Teaching (CFT) is effective in improving students' self-regulation and life science-technical-vocational integrated skills.

Moreover, self-regulation is a significant positive predictor of life science-technical-vocational integrated skills.

RECOMMENDATIONS

Since CFT is proven effective to improve students' self-regulation and life science-technical-vocational integrated skills, this study suggests that CFT must be incorporated in other core subjects in the Senior High School such as Physical Science, General Mathematics, and Oral Communication in Context to ensure that students can still master and apply their career/practical skills that are expected from them in the world of work. Also, it is recommended that curriculum developers and policy makers should look into the possibility of incorporating CFT in revisiting the SHS curriculum guides for the core subjects to develop and

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strengthen students' concept comprehension and to allow integration of practical skills in creating knowledge products or outputs. Lastly, this study proposes that future researchers should implement similar studies for the other strands in the TVL track such as Home Economic and Industrial Arts, and even in Academic, Sports, and Arts and Design tracks in the Senior High School and to replicate the study following a longer and more extensive time for the intervention phase.

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