

Enhancing Student Scholastic Aptitude in Technology & Livelihood Education through Collaborative Learning Strategies

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Abstract: A study was conducted to develop a model on students' scholastic aptitude in Technology and Livelihood Education (TLE) with students' personal attributes, teacher collaborative learning approaches, and quality of school environment among randomly selected 500 Grade 10 students in 10 public secondary schools in Southern Bukidnon District, Philippines. Students have very satisfactory scholastic aptitude in TLE. They demonstrated a positive attitude towards school, constant class interaction, and favorable study habits and preferences. Teachers frequently used collaborative learning strategies specifically student team achievement divisions, jigsaw puzzle approach, and think-pair-share in their TLE classes. The students perceived the public secondary school environment as safe, healthy and stimulating as manifested in their facilities and equipment, school-based garden, and classroom climate. Student scholastic aptitude in TLE was significantly related to the teacher's utilization of collaborative learning strategies. The extent of teachers' utilization of student team achievement division and think-pair-share strategies predict student scholastic aptitude in TLE. Classroom climate, school-based garden, think-pair-share, attitude towards school, and student team achievement division captured the best fit model for students' scholastic aptitude in TLE. In this model, students would likely succeed in their academic endeavor if teaching practices in TLE provide them opportunities to learn together in small groups.

Key Words: collaborative learning, technology & livelihood education, student personal attributes, school environment, scholastic aptitude

Introduction

With the advent of innovation and integrative teaching strategies, the K-12 Basic Education Enhancement Program of the Department of Education (DepEd) of the Philippines has promoted the use of collaborative learning strategies. Virtudes (2017) found that cooperative learning strategies have been highly successful, both in terms of learning achievement as well as the development of morals and values of students. Johnson and Johnson (2004) argued that cooperative learning does not only improve students learning but as well as their social development skills and communication. However, Gonzaga (2011) found that DepEd teachers have limited knowledge of collaborative learning strategies.

On the other hand, educators have always asked whether people's personality characteristics can help them attain higher academic achievement. The effect of personal attributes on performance criteria is worth consideration because school adjustment and scholastic performance are believed to have cumulative effects over time (Caspi, Barrick, Mount & Judge, 2005). Nono

(2009) claimed that high school students felt the inadequacy of the space for learning movement activities which led to distractions in the progress of the learning process.

Technology and Livelihood Education (TLE), a subject in the Philippine secondary school curriculum, covers the basic skills and concepts of home economics, entrepreneurship, and agricultural and industrial arts aimed to develop skill, knowledge, appreciation, and values necessary for effective daily living. Ariaso (2016) stressed the urgency to improve the performance of TLE students with very few enrollees in vocational courses due to perceived low employability.

This research aimed to develop a model students' scholastic aptitude in TLE with students' personal attributes, teacher collaborative learning approaches, and quality of school learning environment. The findings of the study would help secondary school teachers develop their own teaching methods/styles and redirect their efforts by intensifying the use of collaborative strategies in the teaching and learning process.

Review of Literature

Students' Scholastic Aptitude

The teacher's role in student scholastic performance is the most critical influence on a student's success, apart from the home environment (Eggen & Kauchak, 2001). Students achieve high academic performance when teachers are effective. Taylor (2009) characterized effective teacher as one who understands the concepts in inquiry and discipline; creates a positive learning environment; uses available media and fosters positive relationships to facilitate the learning process. The Philippine Education for All Review Report (2015) showed that the national secondary scholastic performance means percentage score (MPS) was 23% below the target, with only 51.4 MPS in AY 2014-2015 categorizing students as average.

According to Belisario (2015), students' scholastic performance of the secondary schools in Northern Mindanao was highly influenced by the active involvement of instructional leadership in developing and communicating shared goals, and increasing ownership of such goals. This will enable them to work hard towards achieving these goals, which in turn will have an impact on the improvement of learner's aptitude.

Students' Personal Attributes

Successful students adopt a positive attitude towards their studies, do not waste time or energy and have more effective study habits than those low-achieving (Oluwatimilehin&Owoyele, 2012). There is, however, a decreasing satisfaction among young people towards institutions, issues about the educational system, and profiles of teachers and their teaching techniques (Marks, 2008). Besides, student interaction is critical in the learning process as it enhances the development of the two very important language skills: speaking and listening among the learners (Douglas, 2009). Interaction helps the learner to think critically and share views with peers. Howarth (2006) reported that student interaction is desirable because learning involves

participation. Thus, teachers need to promote learner interaction to help them succeed. Effective teachers create emotional support and positive relationships toward student learning.

Collaborative Learning Strategies

Cooperative learning techniques require students to work together and be responsible for their learning (Slavin, et al., 2011). In particular, the student team achievement division (STAD) needs a small group of learners to work together to accomplish a shared learning goal (Innovative Learning, 2009). Think-Pair-Share strategy (Lyman, et al., 1988) seeks to encourage student classroom participation, formulate an individual idea, share with others and learn by reflection and verbalization (Jones, 2006). Moreover, Jigsaw learning strategy is effective in motivating and reinforcing students' participation (Mengduo and Xiaoling, 2010). Students taught using collaborative learning techniques have better achievement than those in conventional methods (Koc, et al., 2010). According to Virtudes (2017), using cooperative learning in the instructional process can make teaching interesting and meaningful to the students. Cooperative learning can increase the number of ideas and problem-solving techniques of the students which can develop their skills such as leadership, compromise, communication and sharing responsibility, thus promote desirable scholastic aptitude and academic achievement.

School Environment

Learning environments affect student learning, participation, motivation, sense of well-being, belonging, and personal safety (Falsario, et al., 2014). The availability of basic school infrastructure and facilities is frequently associated with better student learning achievement (World Bank Group, 2016). The school vegetable garden, as a school facility, has the potential to incorporate activity-based learning which may enhance subsequent consumption patterns of students (Devine et al., 2009). Schneider (2002) reported, however, that many school facilities in the Philippines are old and typically in poor conditions

Eric (2005) emphasized the role of a supportive school environment in promoting academic success. He reported that the school environment influenced students' learning and growth, including their social, emotional and ethical development. Students who found their school environment helpful and caring are less likely to be involved in substance abuse, violence, and other problem behavior.

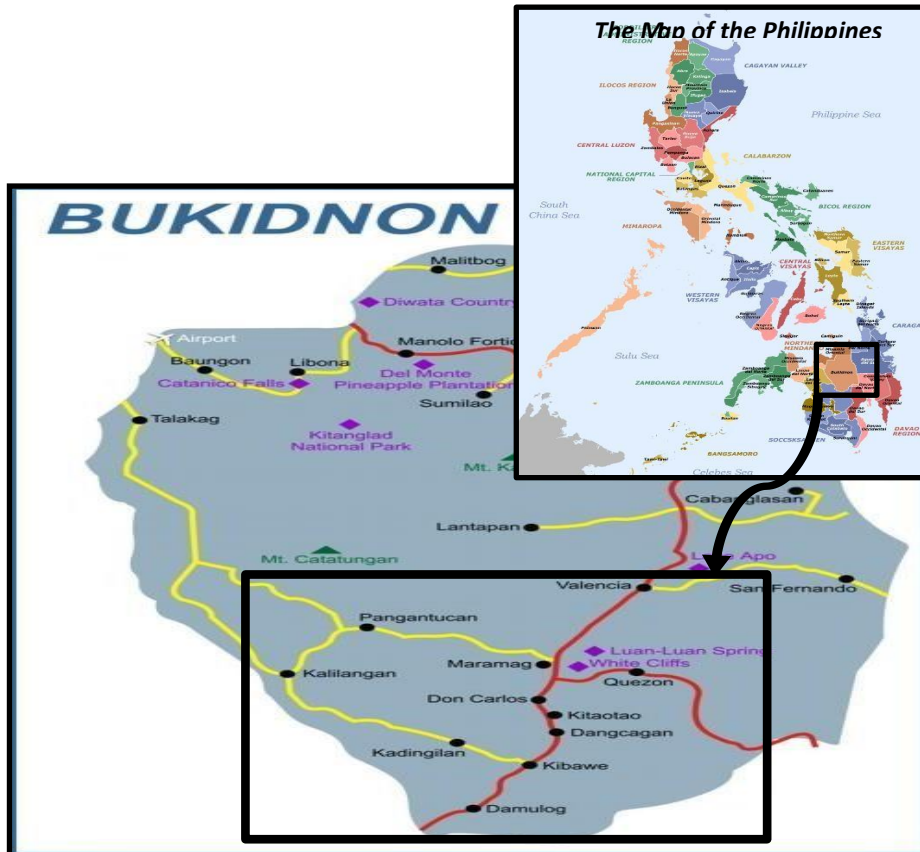
Methodology

The Southern Bukidnon District in Southern Philippines comprised of 35 secondary schools. In AY 2014-2016, these 35 schools obtained a declining National Achievement Test (NAT) mean percentage score (MPS) of 52.16, 50.38, and 48.18 respectively which were within the national performance numerical rating of 51.4% but below the 75% MPS target for Philippine EFA (Philippine Education for All National Review, 2015).

Of the 35 secondary schools, ten (10) schools were randomly selected (Figure 1). For the participants, 500 students were randomly selected representing 10% of the 5,083 total Grade 10

students enrolled in Southern Bukidnon District during the AY 2017-2018 (www.depedbukidnon.net.ph, 2018).

Figure: 1



Map of the province of Bukidnon, Philippines showing the locale of the study

The study used a pre-tested questionnaire with Cronbach's Alpha for students' personal attributes=0.948, teachers' collaborative learning=0.924, and secondary school environment=0.953. The student scholastic aptitude in TLE was based on the student's final average grade in TLE as verified by their TLE teachers using the Department of Education's grading system. Prior informed consent was secured from the students for their voluntary participation in this study. The anonymity of responses was maintained and all information remained confidential and reported as aggregate data. With permission from the secondary school principal, the questionnaires were administered during the end of the academic year to ensure availability of the student scholastic aptitude in TLE.

Data were analyzed using descriptive statistics, Pearson product-moment correlation, and Multiple regression analysis tests. Path analysis was employed to test and estimate causal

relations of the independent (exogenous) variables with student scholastic aptitude in TLE (endogenous) using a combination of statistical data and qualitative causal assumptions.

Findings

Level of Students' Scholastic Aptitude

The mean percentage score (MPS) of students' scholastic aptitude in TLE for AY 2017-2018 was 86.80%, categorized as very satisfactory. Over one-third (169 or 34%) of the Grade 10 students obtained an outstanding scholastic aptitude which exceeded the core requirements in terms of knowledge, skills, and understanding of the subject matter and can transfer this knowledge and skills through an authentic task. This scholastic aptitude in TLE is higher than the national numerical rating of 75 indicated in the Philippine Education for All National Review Report (2015).

The Extent of Student Personal Attributes

The results indicate a strong student attitude towards school with an overall mean score (OMS) of 4.39. This implies that students have a positive attitude towards learning and favorable emotional disposition towards TLE. Sejcova (2015) found that attitude towards school contributes to good class results of students.

The students demonstrated favorable study habits and preferences as shown in the overall mean score of 3.90. This suggests that students can learn by working together in groups with the guidance of a teacher who is friendly and approachable. According to Soares et al. (2009), students will most likely succeed in their academics if they adopt different learning strategies, study skills, and study behavior; use information resources; take notes; communicate with teachers, and prepare for and take examinations. Study habits and preferences help students actively respond to class instruction and derive meaning from it (Vacca, et al., 2015). The result also suggests that students need to improve their study habits if they want to excel and promote efficiency in their daily tasks.

Similarly, students manifested strong interaction during their TLE class with an overall mean score of 3.94. This implies that students interact with one another during class discussions, providing them a chance to exchange ideas. Classroom interaction such as sharing information and participating in the discussion can lead to a better understanding of any course experience (Sato, 2015). Palmer (2009) opined that classroom interaction enhances students' communicative abilities and social skills by sharing their feelings and opinions.

Utilization of Collaborative Learning Strategies of Teachers

Results show that the TLE teachers utilized student team achievement division (STAD) learning strategy on most occasions (OMS=4.08). This means that teachers promote group works and encourage students to work cooperatively in the assigned task. Aguantaand Tan (2018) found that group learning can increase the enjoyment of the course and the subject matter. Difficult subjects such as engineering and mathematics may be made easy when discussed with another

person. Students will become more motivated to study if supported by a team, which could also enhance their critical thinking.

With an overall mean score of 4.01, the think-pair-share learning strategy was used by the teachers in most occasions in TLE class. This suggests that teachers enable students to generate ideas and share them with other students, which enhances their oral communication skills. This strategy promotes higher-level thinking skill as teachers encourage students to think, discuss and share their thoughts with the group (Nichols, 2014). Incentives for students learning can also motivate them to perform better with a sense of pride and accomplishment (Peterson, 2005).

The jigsaw puzzle was utilized by the teacher in TLE class on most occasions (OMS= 4.06). This indicates teachers' ability to engage students' active participation in accomplishing learning goals. Hänze and Berger (2007) found that a group is effective when the teacher involves students in their own learning, deepening their knowledge and developing particular skills. This "cooperation by design" enhances interaction among students which lead them to value one another as contributors to their common task.

Quality of School Environment

The students rated the facilities and equipment of the school as very satisfactory (OMS=4.00). This suggests that DepEd schools in Southern Bukidnon District have facilities and equipment which provide a favorable climate that could enhance the academic performance of students in TLE. According to Freeman (2017), proper maintenance and operations of school facilities help ensure a safe and healthy learning environment, while their deficiencies may have serious ramifications in student learning and performance (Limon, 2016). Figueroa, et al. (2016) reported that children will have better academic standing if they gain access to basic amenities including the provision of electricity and libraries which could improve learning (Bacolod and Tobias, 2006).

With an overall mean score of 4.20, the results show that students perceived the school garden as very satisfactory. This implies that schools employ processes that promote health, nutrition, and social consciousness. According to McCarty (2013), hands-on learning in the school garden program could improve student engagement and academic success. Aguanta and Dansal (2014) found that school gardening program is highly effective in stimulating positive outlook, interest, practical experience, and preference in eating vegetables among pupils.

On the other hand, the results indicate that DepEd schools in Southern Bukidnon offered very satisfactory classroom climate (OMS=4.24). This suggests that TLE teachers value students' ideas and opinions during class discussions and intellectual discourse which can develop competency and critical thinking. Barr (2016) asserted that teachers rapport with students improves learning and motivation. Ganap (2018) concluded that a favorable school climate promotes hard work which could enhance student's academic achievement.

Correlation Analysis between Student Scholastic Aptitude in TLE and Students' Personality Traits, Teachers Collaborative Learning Strategies and Quality of School Environment

Correlation results in Table 1 reveal a significant relationship between student scholastic aptitude in TLE and teachers' collaborative learning strategies with $r=0.112$, ($p=0.012$) and its observed variables namely: student team achievement division $r=0.109$, ($p<0.05$); think-pair-share $r=0.134$, ($p<0.01$); and jigsaw puzzle $r=0.162$, ($p<0.05$). This implies that when teachers utilize these collaborative learning strategies in their TLE class, better scholastic aptitude is developed among students. More specifically, when teaching practices in TLE provide opportunities to learn together in small groups, students would likely succeed in their academic endeavor. These strategies could encourage students to work by themselves allowing them to be more actively engaged in learning with an emphasis on cooperation over competition. The result is consistent with the study of Keramati (2010) which found that the experimental group of students taught by cooperative learning (STAD technique) were more successful in their academic work than the control group. Usman (2015) concluded that the think-pair-share strategy implemented in the classroom encourages individual participation which promotes academic achievement. Based on the findings, the hypothesis which states that "there is no significant relationship between student scholastic aptitude in TLE and teachers' collaborative learning strategies", is rejected.

However, correlation results do not show a significant relationship between students' scholastic aptitude in TLE and their personal attributes and quality of the school environment. Hence, the hypothesis which assumed significant relationships of student scholastic aptitude in TLE with student personal attributes and quality of the school environment is accepted.

Table: 1

Correlation analysis between students' scholastic aptitude in TLE and independent variables

INDICATORS	CORRELATION COEFFICIENT	PROBABILITY
Students' Personal Attributes	0.062	0.165ns
Attitude towards school	0.064	0.150ns
Study habits and preferences	0.039	0.388ns
Student interaction	0.058	0.195ns
Teachers' Collaborative Learning Strategies	0.112	0.012*
Student team achievement division	0.109	0.015*
Think-pair-share	0.134	0.003**
Jigsaw puzzle	0.162	0.027*
Quality of School Environment	0.033	0.460ns
Facilities and equipment	0.026	0.569ns
School-based garden	0.045	0.317ns
Classroom climate	0.012	0.785ns

- ** Correlation is significant at 0.01 level (2-tailed).
- * Correlation is significant at 0.05 level (2-tailed).
- ns Not significant

Results of Regression Analysis between Student Scholastic Aptitude in TLE and Independent Variables

The regression analysis shows that teachers’ collaborative learning strategies particularly think-pair-share ($\beta = .134$, $t (3.028)$, ($p < 0.01$) and STAD ($\beta = .172$, $t (3.634)$, ($p < 0.01$) positively predicted student scholastic aptitude in TLE. The positive beta weights showed that a 1% increase in the teachers’ utilization of think-pair-share and STAD strategies would result to an increase of 1.075 and 1.374, respectively on the student scholastic aptitude in TLE, holding other variables constant. The R^2 which is 2.80% reflects the amount of variance explained by these two strategies towards student scholastic aptitude, while 97.20% can be attributed to other factor variables not included in the regression model (Table 2).

Table:2
Variables that best predict scholastic aptitude in TLE

VARIABLES	Unstandardized Coefficients		Standard Coefficient	t	Sig.
	B	Std. error	Beta		
(Constant)	82.491	1.445		57.090	.000
Collaborative learning strategies: Think-Pair-Share	1.075	.355	.134	3.028	.003
Student team achievement division	1.374	.378	.172	3.634	.000
$R = 0.167$	$R^2 = 0.028$	$F = 9.168$	$\text{Sig.} = 0.003$		

From the foregoing analysis, the model in predicting scholastic performance in TLE is illustrated as:

$$Y = 82.491 + 1.075X_1 + 1.374X_2$$

- Where: 82.491 is constant
- $X_1 =$ Think-pair-share
- $X_2 =$ Student Team Achievement Division

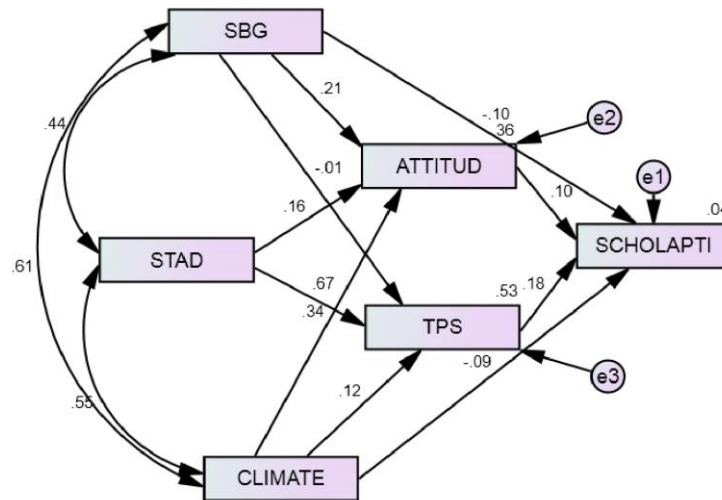
This suggests that when teachers utilize think-pair-share and STAD strategies in TLE class, student scholastic aptitude improves. Students learn and retain more information when they actively participate in the learning process and relate to what is being taught. Akey (2006), Garcia (2017), and Aguanta and Tan (2018) reported that instructional strategies such as collaborative learning have greatly increased student academic aptitude.

The Model of Student Scholastic Aptitude in TLE

The Causal Model below showcases the direct and indirect effects of students’ personal attributes, teachers’ collaborative learning strategies, and quality of school environment on student scholastic aptitude in TLE as schematically shown in Figure 2.

The Model in Figure 2 shows that the school-based garden (SBG), STAD, classroom climate (CLIMATE), attitude towards school (ATTITUD), think-pair-share (TPS) were included and assumed to generate positive causation on student scholastic aptitude (SCHOLAPTI). The overall strength of effects produced directly and indirectly by these five (5) variables is only 4%. Moreover, the indirect effects of STAD show positive beta weights (0.13) on student scholastic aptitude (Table 3).

Figure: 2



Legend:

- ATTITUD – Attitude towards School
- STAD – Student Team Achievement Division
- TPS – Think Pair Share
- SBG – School-Based Garden
- CLIMATE – Classroom Climate
- SCHOLAPTI – Student Scholastic Aptitude

Causal model on student scholastic aptitude in TLE

Table:3

Standardized direct, indirect and total effects on scholastic aptitude causal model

VARIABLES	DIRECT EFFECT	INDIRECT EFFECT	TOTAL EFFECT
CLIMATE	-0.09	0.06	-0.04
STAD	0.00	0.13	0.13
SBG	-0.10	0.02	-0.08
TPS	0.18	0.00	0.18
ATTITUD	0.10	0.00	0.10

Legend:

- CLIMATE – Classroom Climate
- STAD – Student Team Achievement Division
- SBG – School-Based Garden
- TPS – Think Pair Share
- ATTITUD – Attitude towards School

In general, teachers’ collaborative learning strategies show consistently positive with the best strength of effects among variables. Gamit (2017) found that collaborative learning strategy positively improved students’ scholastic performance, reduced anxiety and promoted positive attitudes toward the course. Conversely, school environment such as classroom climate and school-based garden have negative direct and total effects on students’ scholastic aptitude in TLE. Bartoces (2013) reported that students do not like school gardening activity implying low prestige attached to vocational education and farming.

In the model, all indices comply with the goodness-of-fit values (Table 4). Student scholastic aptitude in TLE is best anchored on classroom climate, school-based garden, think-pair-share, attitude towards school, and STAD.

Table:4

Goodness-of-fit indices of scholastic aptitude causal model

CRITERION INDEX	STANDARD VALUE	MODEL FIT VALUE
CMIN/DF	<2.00	0.684

P-VALUE	>.05	0.505
GFI	>.90	0.999
NFI	>.90	0.999
TLI	>.90	1.005
CFI	>.90	1.000
RMSEA	<.05	0.000

Legend:

CMIN/DF – Chi-square Minimum/Degrees of Freedom

GFI – Goodness of Fit Index

NFI – Normed Fit Index

TLI – Tucker-Lewis Index

CFI – Comparative Fit Index

RMSEA – Root Mean Square Error of Approximation

Conclusion

The secondary school students in Southern Bukidnon District have very satisfactory scholastic aptitude in TLE. They exhibited strong personal attributes: positive attitudes towards school, favorable study habits and preferences, and constant interaction in their TLE class. They likewise displayed affirmative thinking, diverse study method, and skill, and shared responsibility for learning.

TLE teachers highly utilized the collaborative learning strategies which ensure students active engagement in learning. The Department of Education has provided a favorable school environment that supports learning in TLE.

Student scholastic aptitude in TLE is significantly related with collaborative learning strategies, specifically the STAD, think-pair-share and jigsaw puzzle leading to desirable attitudes, motivation, and adoption of cooperative working habit among students. STAD and think-pair-share strategies empirically influenced student scholastic aptitude in TLE.

The path analysis anchored on the school-based garden, STAD, classroom climate, attitude towards school, and think-pair-share capture the best fit model of scholastic aptitude in TLE. These variables contribute to the academic success of the students when considered in the teaching-learning process of TLE.

Suggestions and Recommendations

The school needs to design and implement learner-centered activities and programs that can enhance students study habits. The DepEd-Bukidnon innovative reading program entitled, “Buddy Ko, Sagot Ko” can be adopted in every school to strengthen student responsibility for their learning. Moreover, teachers may need to develop localized instructional materials that will cater to the individual and group needs of the students. Other collaborative learning techniques like dyad cooperative learning strategy (DCL) and peer-led team learning strategy (PLTL) may

also be tried to enhance the learning of TLE. Teachers are also encouraged to attend training and conferences to update them on new teaching-learning strategies.

The DepEd may establish a partnership with relevant stakeholders to provide financial or material support to schools for TLE instruction. Future research may use experimental design to validate the results of the study across other academic disciplines as well as consider other variables not included in the study.

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