



A STRUCTURAL EQUATION MODEL FOR TECHNICAL WRITING COMPETENCY OF STUDENTS

Nor-en Eman-Bangkulit¹, Marilou Y. Limpot²

¹Doctor of Philosophy in Filipino, University of Mindanao, Davao City, Philippines

²Doctor of Education, University of Mindanao, Davao City, Philippines

Article DOI: <https://doi.org/10.36713/epra11461>

DOI No: 10.36713/epra11461

ABSTRACT

The general purpose of this study is to investigate the best fit model for the ability of students in technical writing that used structural equation modeling (SEM) as the basis for the design of the instrument in analyzing the relationship between affective factors, teacher communication behavior, vocabulary learning strategies and technical writing competency. A descriptive-causal design and stratified random sampling technique were used to select 400 students. Four questionnaires were used to collect data through an e-survey. Mean, standard deviation, Pearson product-moment correlation and multiple regression analysis were also used to analyze the data collected. It was found that all the variables are at a high level which means that the respondents are often exhibiting them. The affective factors, teacher's communication behavior, and vocabulary learning strategy have a significant relationship with students' competency in technical writing. The most appropriate technical writing competency model is model 5 with attitude and skill indicators. Motivation and self-confidence are indicators of the affective factor. Challenging, encouragement and praise, understanding and friendly are the teacher's behavior in communication. Vocabulary learning strategy with cognitive, metacognitive, memory, and determination indicators. It only indicates that the affective factor, teacher's communication behavior, and vocabulary learning strategy plays an important role in students' technical writing competency.

KEYWORDS: education, affective factors, teacher communication behavior, vocabulary learning strategies, technical writing competency, SEM, Philippines.

INTRODUCTION

Technical writing is a challenging skill that students have to learn in school. Failure to meet this requirement will result in frequent errors in spelling, correct use of words, and grammar. The problems in this skill also include the lack of linguistic skills including grammar, a relation of vocabulary to be used, fear of writing, lack of ideas, and weakness in the structure and organization of sentences. These weaknesses may be the influence of teacher training, ineffective strategy and system of tests, lack of training in reading and writing, a large number of students in the classroom, lack of motivation, and lack of ideas. (Fareed et al. 81-92, Farooq et al. 183-194).

A study revealed that affective factors such as anxiety affect students' high motivation in language learning and macro writing skills (Zayed and Ghamdi 109-112). A study also confirms the main cognitive and motivational forces in the academic domain in technical writing. It was found that their motivation significantly influenced their writing performance. Both cognitive and motivational variables only affect students' writing skills (Graham et al. 82-104).

The teacher needs to know the art of patterns and methods in writing work. It is also necessary for the teacher to have extensive knowledge of the pedagogical perspectives in

teaching this skill to properly teach the aforementioned skill (Nasser 191-203). The study found that the teaching focused on the work of the students to cultivate motivation and academic performance in learning. Teaching styles play an important role in motivation and academic performance for meaningful learning (Anwer 154-170).

Language learning strategies have a positive and significant relationship with students' performance (Uslu et al. 73-78). Vocabulary learning strategy includes sentence construction skills and their unity. Added to this are the frequent problems that interfere with good writing such as technical writing (Wang et al. 176-183).

It was discovered that the most frequent mistakes made by students are in punctuation, followed by spelling mistakes, use of prepositions, articles, wrong aspect of the verb, and wrong use of the appropriate word in the sentence. It has also been proven that the cause of this error is the transfer of Interlingual and intralingual (Khatter 364-381). A study proved also the students' difficulty in developing relevant ideas, lack of understanding of simple present-day aspects, lack of vocabulary, and mistakes in the mechanics of writing (Jayanti 71-94).



Although there are studies that have been mentioned and to the knowledge of the researcher, there has not been much local study to determine if there is a relationship between affective factors, teacher's communication behavior, vocabulary learning strategies, and ability of students in technical writing. Therefore, the researcher was motivated to conduct a study to

help increase awareness of the writing task, especially the technical type of writing. It will also help to increase the quality of education in the Philippines and make the programs included in it more prosperous. So, this study was conducted to help fill the gaps in students' technical writing-related issues.

OBJECTIVES

This research aims to investigate the best fit model on students' ability in technical writing using the affective factor, teacher's communication behavior, and vocabulary learning

strategies as exogenous variables and students' competency to technical writing as an endogenous variable.

METHODS

This study used a quantitative causal research method using an appropriate Structural Equation Model for technical writing competency. It measures and describes statistical associations of variables with different scale levels (Ullman and Bentler 661). The researcher used the mean, standard deviation, Pearson Product Moment Correlation, and multiple regression

analysis for a broader meaningful interpretation and correlation of the variables.

The respondents were selected through stratified random sampling because the population is heterogeneous (Parsons 1-11). Since it is a proportional percentage, the number of respondents from the universities that source the data will be counted from different sections.

RESULTS AND DISCUSSION

Table 1
Level of Affective Factors in Language Learning

Indicator	SD	Mean	Descriptive Level
Motivation	0.55	4.07	High
Attitudes	0.58	4.24	Very high
Self-confidence	0.60	4.22	Very high
Anxiety	0.75	2.39	Low
Total	0.42	3.73	High

Table 1 shows the level of affective factors in language learning of first-year college students of Region XII Universities. It has an overall mean of 3.73 with a descriptive level of high. It means that the students agree with the items contained in motivation, behavior, and self-confidence while they do not agree with the anxiety items because their level is low. It simply indicates that students often exhibit affective factors in language learning other than the anxiety indicator.

Having a high level of language learning has great help to develop the child's language learning process but when it is not monitored, it will cause weakness in learning languages (Khaleghi 185-189). It was found that students' achievement is significantly related to their motivation, attitude, and willingness to learn. Instrumental orientation, motivational behavior, behavior, and perception were found to be predictors of their success in classroom activities. Therefore, the creation of a harmonious classroom environment affects the efficiency of students (Cocca and Cocca 1-10).



Table 2
Level of Teacher Behavior in Communication

Indicator	SD	Mean	Descriptive Level
Challenging	0.66	4.20	Very high
Encouragement and Praise	0.66	3.92	High
Non-Verbal Support	0.71	3.96	High
Understanding and Friendly	0.68	4.26	Very high
Controlling	0.65	4.06	High
Total	0.56	4.08	High

It can be seen in table 2 that the teacher's level of communication behavior has a total mean of 4.08 with a standard deviation of 0.5 with a descriptive level that is high. The overall result of this table has a descriptive level of high which means that the students agree with the items contained in challenge, encouragement and praise, non-verbal support, understanding and affection, and control. It simply means that their teacher often exhibits communicative behavior in teaching.

The relationship between teacher and student is one of the factors that help students learn. Positive interaction creates a

conducive learning environment. A teacher who acknowledges the positive rather than the negative aspects of his students helps his students behave well. Too much emphasis on negative behavior rather than praising them will result to a not good relationship between teacher and student (Agyekum 121-122). The work of the teacher in questioning can maintain, move, and challenge the students and most of all helps them to know the previous knowledge and understanding about thinking, cultivating reason, problem-solving, and forecasting (Olufemi et al. 43-56).

Table 3
Levels of Vocabulary Learning Strategy

Indicator	SD	Mean	Descriptive Level
Cognitive	0.69	3.70	High
Metacognitive	0.67	3.91	High
Memory	0.77	3.87	High
Determination	0.78	3.89	High
Total	0.62	3.84	High

Table 3 describes the level of vocabulary learning strategy with a total mean of 3.84. The overall result of this table is high which means that the students agree with all the items contained in the cognitive, metacognitive, memory, and determination strategies. This simply indicates that they often demonstrate their vocabulary learning strategy.

A high level of vocabulary learning strategy can be linked to an articulation of learning. Vocabulary is very important in language learning and the lack of knowledge in this

matter will cause difficulty in learning. Knowledge here is affected by vocabulary learning strategies (Putra 74-81). Another study also confirms that vocabulary learning strategies such as cognitive, metacognitive, and social strategies are needed to help students produce good writing. In the writing process, it is necessary to think carefully about the topics or themes. Topic sentences, supporting details, and conclusions also need to be thought through. This process is called planning which belongs to the metacognitive strategy (Al-jarrah 199).



Table 4
Level of Students' in Technical Writing Competency

Indicator	SD	Mean	Descriptive Level
Attitude	0.67	3.76	High
Skill	0.67	3.61	High
Knowledge	0.72	3.51	High
Total	0.61	3.63	High

Table 4 shows the level of students' technical writing ability has a total mean of 3.63 with a corresponding standard deviation of 0.61 with a descriptive level of high. This table indicates that students' attitudes, skills, and knowledge in technical writing are high. It simply means that they agree with and often express all of the items contained in this indicator variable.

It has been proven in a study that writing technical writings are just as challenging as writing discourses. It was

found that the students of the University of Anbar do not have much ability in writing discourses because many of them showed errors in lexical, syntactic, semantics, literal translation, repetition of words, cohesion, and anaphoric and cataphoric errors. These mistakes are experienced by students because of the difficulty in learning English as a foreign language (Khalaf and Fadel 521-532).

Table 5
Relationship between the Exogenous Variables and Technical Writing Competency

	Technical Writing Competency			Significance
	Attitude	Skills	Knowledge	
<i>Affective Factors in Language Learning</i>	.587** .000	.414** .000	.361** .000	.505** .000
<i>Teacher Communication Behavior</i>	.592** .000	.482** .000	.364** .000	.532** .000
<i>Vocabulary Learning Strategies</i>	.717** .000	.606** .000	.503** .000	.677** .000

It was found that the teacher's communication behavior had a significant relationship with the students' ability in technical writing. This simply means that the teacher's communication behavior indicators of challenging, persuasion and praise, non-verbal support, understanding and friendliness and control play an important role in students' technical writing ability.

It has been found that giving frequent tests, exams and frequent praise for the writing done by the child can increase the motivation to improve his writing even more (Graham 258-279). It was also mentioned in a study that the result of an essay will be good through the good direction given by the teacher. In addition to this is guidance, feedback, collaboration between teacher and student. The teacher can organize the classroom where the students will write to guide their writing performance (Graham et.al 139).

A study proves that when students use vocabulary learning strategies, they learn quickly and their writing becomes easier. In addition, they can organize their own language learning and are able to write on their own (Fiani 220-233.). It was also proven in a study that the student's efficiency in the development of ideas, organization of the text, orderliness of the text, vocabulary, spelling and presentation of the text is due to the use of cognition and metacognition that are part of the strategy in learning vocabulary. This development is attributed to instructional programs and effective training. Through this strategy, there is also development in communicative intent, proper sentence construction, word relationships and the use of adverbs. He added that metacognition helps improve writing. In other words, the metacognitive condition is able to make progress and achieve a better writing product (Colognesi et al. 459-194).



Table 6
Significant Influence of Affective Factors in Language Learning, Behavior of Communication Teacher, Vocabulary Learning Strategy on Students' Technical Writing Competency

Students' Technical Writing Skills					
Exogenous Variables		B	B	T	Sig.
Constant		.767		3.915	.000
Affective Factors in Language Learning Teacher		.267	.183	4.215	.000
Communication Behavior		.158	.145	2.712	.007
Vocabulary Learning Strategies		.525	.527	10.828	.000
R	.701				
R ²	.491				
ΔR	.488				
F	133.947				
P	.000				

Table 6 shows the significant influence of language learning affective factors, teacher's communication behavior, and vocabulary learning strategy on the technical writing ability of first-year college students in the universities of region XII with an F-value of 133.947, R-value of .701 and R2 .491, and p-value of .000 which is well below the .05 level of significance set in this study.

In sum, the affective factor, teacher's communication behavior, and vocabulary learning strategy have a significant influence on students' ability in technical writing. This simply indicates that the exogenous variables are significant and have a significant contribution to students' technical writing competency.

It is confirmed in a study that if students' motivation is low, various problems and situations appear and if students are not motivated to learn, meaningful learning becomes complicated for them (Alizadeh 11- 15). It was mentioned in a study that the relationship between the teacher and the student through different communication skills, whether verbal or non-verbal, brings good learning results. It has been proven in the study that the use of verbal and non-verbal communication in teaching motivates and guides students to pay attention to the lesson (Bambaeeroo and Shokrpour 51). The study also found that through pedagogical initiatives by teachers, weak students can be helped to cultivate in them the use of metacognitive strategies to further increase their knowledge of appropriate language use (Qin and Zhang 393).

Table 7
Summary of Goodness of Fit Measures of Five Structural Models

Model	P-value (>0.05)	CMIN / DF (0<value<2)	GFI (>0.95)	CFI (>0.95)	NFI (>0.95)	TLI (>0.95)	RMSEA (<0.05)	P-close (>0.05)
1	.000	10.011	.758	.811	.795	.775	.147	.000
2	.000	6.831	.836	.880	.863	.854	.118	.000
3	.000	6.769	.836	.880	.863	.856	.117	.000
4	.000	4.547	.880	.928	.910	.911	.092	.000
5	.060	1.397	.978	.995	.983	.992	.031	.952

Legend: CMIN/DF – Chi Square/Degrees of Freedom

NFI – Normed Fit Index

GFI – Goodness of Fit Index

TLI – Tucker-Lewis Index

RMSEA – Root Mean Square of Error Approximation

CFI – Comparative Fit Index



The final objective of this research focuses on identifying the best fit model that represents variables as predictors of technical writing competency.

In determining the most suitable model, all indices must be contained in an acceptable number. Chi-squares/degrees of freedom values are less than 5 with corresponding p-values greater than 0.05. The root mean square approximation value must be less than 0.05 and the corresponding p-close must be greater than 0.05. Other indices such as the normed fit index, Tucker Lewis index, comparative fit index, and the goodness of fit index must be higher than 0.95.

The Hypothesized Structural Model 5 was found to show the best fitting data model as indicated by CMIN/DF= 1.397, p-value = 0.060, RMSEA = .031, p-close= 0.952 and indices such as NFI (0.983), TLI (0.992), CFI (0.995) and GFI (0.978). All indices with corresponding values were greater than 0.95 or met the requirements for the goodness of fit measures. Because model 5 developed is the best fit model of technical writing competency, it does not warrant further testing of any models. Therefore, the hypothesis is rejected.

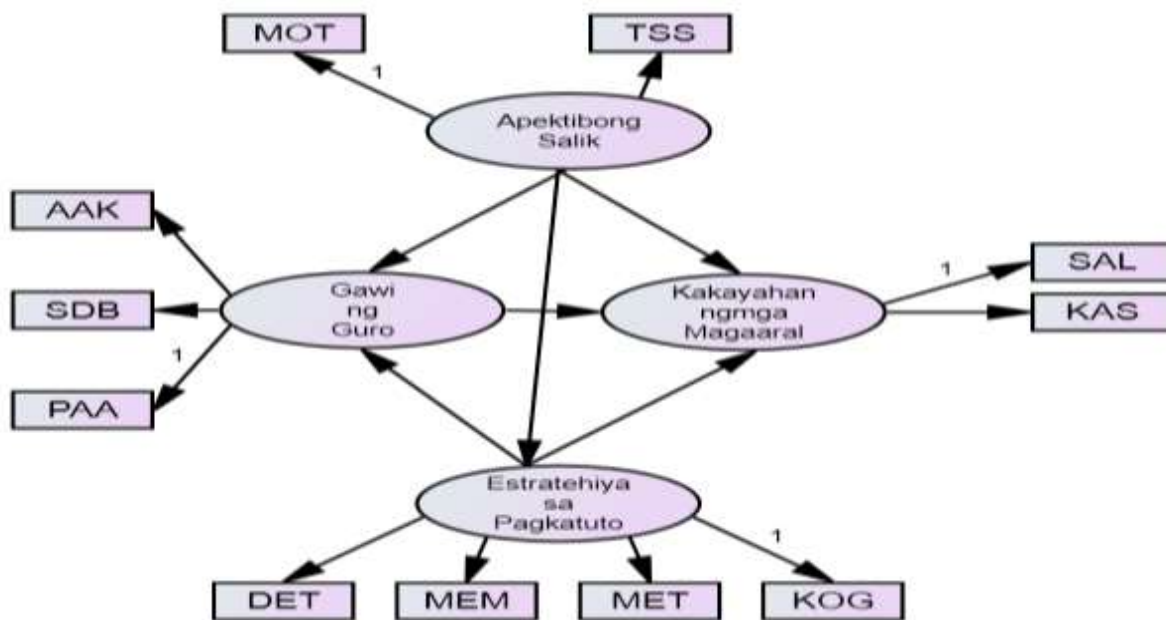


Figure 2. Best Fit Structural Model on Technical Writing Competency



Legend:

MOT-Motivation (Motibasyon)	SDB-non-verbal support (suportang di-berbal)	MEM-Memory (memori)
PAU-Attitude (Pag-uugali)	PAT-Understanding and Friendly (pag-unawa at pagkagiliw)	DET-Determination (determinasyon)
TSS-Self-confidence (Tiwala sa Sarili)	PAK-Controlling (pagkontrol)	SAL-Attitude (saloobin)
PAG-pagkabalisa (Anxiety)	KOG-Cognitive (Cognitive)	KAS-Skills (kasanayan)
PAA-Challenging (Paghahamon)	MET-Metacognitive (metakognitib)	KAA-Knowledge (kaalaman)
PAP-Encouragement and Praise (Paghimok at Pagpuri)		

CONCLUSION

The result showed that the level of an affective factor in language learning, teacher's communication behavior, vocabulary learning strategy, and technical writing competency is high which only indicates that it is agreed and often expressed by the respondents in the first year in college of the universities of region XII, the referred items in this variable.

The variables affective factors, teacher's communication behavior, and vocabulary learning strategy have a significant relationship with students' technical writing competency. So, the null hypothesis was not accepted. Of the five investigated models, model 5 had indices that were consistent and indicated that the data fit best. Therefore it was identified as the most appropriate model. The result of the goodness of fit of model 5 is very acceptable because all the indices meet the set criteria against the obtained value of the best fitting model.

Vygotsky's Social Cultural Theory of Writing supported this by valuing motivation and social influence in the components

of writing. It explains the learning of skills as a social process and how an individual's talents and abilities are derived from society and culture. In addition to this theory, interaction is very important in the development of the mental learning process. Vygotsky introduced the Zone of Proximal Development which states that the learner needs help and interaction to develop self-confidence (Hodge 139-146). It affirmed in behaviorism theory, wherein children are born with the ability to learn and their behavior can be shaped by controlling their environment. Children's intellectual abilities can be enriched and developed with the help of appropriate reinforcements. A behaviorist emphasized that it is necessary to "take care" of intellectual development by motivating and encouraging and strengthening it. There is also a belief that a child can perform any task if he is taught and given the right direction.

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