

# Autonomous Learning, Metacognitive Awareness and Science Academic Achievement of Pre-Service Teachers

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## ABSTRACT

This study examined the interrelation of the level of autonomous learning, metacognitive awareness and science academic achievement of the 85 randomly selected pre-service teachers of Nueva Vizcaya State University, Bambang Campus. Descriptive-correlational design was employed. The result of the analyses revealed a low level of autonomous learning among pre-service teachers. On the other hand, high level of their metacognitive awareness was reported. Pre-service teachers' metacognitive awareness was found to positively correlate with their academic performance. However, no significant correlation was found between their autonomous learning and academic performance. Based on these, it is recommended that metacognitive awareness and autonomous learning be enhanced through incorporating different collaborative methods and activities where the learners can work collaboratively and independently, and at the same time, enabling them to deeply reflect and ponder in their lessons. In this regard, integrating such method in the instruction may lead to a positive result in the learners' academic performance.

**Keywords:** *autonomy, metacognition, collaboration, independent learning, academic performance*

## INTRODUCTION

Education aims to develop the learners' knowledge as well as their strategy in learning. Globally, the major goal of 21<sup>st</sup> century education is not only to provide the learners with a vast amount of facts and knowledge, but also to improve their self-regulatory skills which will help them become independent learners; learners who have the cognitive and metacognitive abilities as well as motivational beliefs and attitudes required to comprehend, supervise and control their own learning which can also be termed as autonomous learning. <sup>[1]</sup>

Autonomous learning is a mode of learning where the learner is accountable for all of his/her learning and actively

participates in the fulfillment of his/her decisions. <sup>[2]</sup> It is also defined as the ability of the learner to take charge with their own learning. Autonomous learners use and apply their knowledge in every situation that they encounter in their lives. Thus, autonomous learners tend to foster higher performance in school. <sup>[3]</sup> They possess the ability to work on their own and perform better and are most likely to attain academic success. <sup>[1]</sup>

Metacognition is an activity which involves the learners in the learning processes and aims to improve critical thinking, reasoning, and problem-solving skills of the learners. <sup>[4]</sup> Based on this, it can be inferred that metacognition is categorized

under higher order thinking skill which involves active control over one's mind while being engaged in learning. Higher metacognition leads to better academic performance which proves that metacognition is one of the factors that contribute to the learners' higher academic performance. [5]

Due to globalization, autonomous learning and metacognitive awareness have been widely studied in other countries, most especially by the western countries. For the past years, Filipino researchers also ventured in these studies. Hence, one of the goals of the Philippine education in the K to 12 Basic Education Curriculum is to improve the learners' metacognition and to promote autonomous learning among students. [6] Moreover, it is revealed that continued exposure and engagement of the learners with higher order thinking skills and individualized learning in schools give them the best opportunity to enhance their way of thinking and learning can lead them to high academic performance. [7]

At Nueva Vizcaya State University (NVSU), Bambang Campus, it was observed that the students exhibit low autonomous learning; they tend to be dependent on their teachers, friends and classmates. Moreover, their metacognitive awareness is not evident in their ways of studying and learning. Autonomous learning and metacognitive strategies of the learners greatly affect their achievement in their subjects and lessons. [8] It is in this light that the researchers ventured in studying the autonomous learning and metacognitive awareness of the pre-service teachers from the College of Teacher Education (CTE) in NVSU- Bambang Campus in relation to their academic achievement in science.

## **METHODOLOGY**

This study employed a descriptive-correlational research design that aimed to establish the significant intercorrelation of the level of autonomous learning, metacognitive awareness and science academic performance of pre-service

teachers. Out of 143 pre-service teachers, a total of 85 students were selected using random sampling. The students were taking up bachelor of Secondary Education (BSEd) and Bachelor of Elementary Education (BEEd) at Nueva Vizcaya State University-Bambang Campus, Philippines.

Adapted research instruments were used to measure the respondents' level of autonomous learning and metacognitive awareness. The Learner Autonomous Learning Questionnaire (LALQ) was adapted from Gholami and Hamid. [9] The instrument was found to be valid in the context as it has assumed internal consistency, Cronbach's  $\alpha = 0.88$ . The instrument included a 40-item questionnaire which was utilized to determine the respondents' level of autonomous learning. It consists of eight dimensions, namely readiness for self-direction, independent work in science learning, the importance of class/teachers, the role of teachers, explanation/supervision, science learning activities outside the class, selecting content, intrinsic motivation, and assessment/motivation. On the other hand, the Awareness Learning Metacognition Questionnaire (ALMQ) was adapted from La Marca. [10] The Cronbach's  $\alpha = 0.99$ , reveals that the instrument was valid within the context. The instrument included a 33-item questionnaire to measure features of metacognition. It consists of two dimensions, namely responsible learning and motivated commitment.

The Likert scale was adapted for both questionnaires to determine the degree of pre-service teachers' agreement with each statement. Furthermore, the level of autonomous learning and metacognitive awareness had been determined using the following ratings: very high (3.26-4.00), high (2.51-3.25), low (1.76-2.50), very low (1.00-1.75). The study also utilized the pre-service teachers' average grade in all science-related subjects to determine their science academic achievement. The level of science academic achievement was based from following ratings: outstanding (1.00 to

1.25), very satisfactory (1.26 to 2.00), satisfactory (2.01 to 2.75), least satisfactory (2.76 to 3.50), fair (3.51 to 4.25), failed (4.26 to 5.00).

Normality of data distribution was tested using Kolmogorov Smirnov's test ( $p > .05$ ). The data distribution was also found within the accepted range based on the kurtosis and skewness values. Descriptive statistics such as mean and standard deviation was utilized in determining the level of preservice teachers' academic achievement, autonomous learning and metacognitive awareness. Meanwhile, the correlation between the constructs was determined using Pearson's  $r$ .

## RESULT AND DISCUSSION

### Problem 1. What is the level of autonomous learning of the pre-service teachers?

Table 1 shows the means and corresponding qualitative descriptions of pre-service teachers' level of autonomous learning.

**Table 1. Pre-service teachers' level autonomous learning across the different dimensions of learning autonomy**

Scales	Mean	Level of Autonomous Learning
Readiness for Self-Direction	2.73	High
Independent Work in Learning	2.70	High
Importance of Work/Teacher	2.25	Low
Role of Teachers/ Supervision	1.92	Low
Learning Activities Outside the Class	2.81	High
Selecting Content	2.74	High
Intrinsic Motivation	2.24	Low
Assessment	2.21	Low
Overall Autonomy	2.451	Low

The table reveals high levels of autonomy among students as reflected from their self-assessment of their beliefs relating to self-directed learning in general ( $M=2.73$ ), beliefs about independent work in science learning ( $M=2.70$ ), their attitude in relation to particular science learning activities done outside the classrooms ( $M=2.81$ ), and attitude relating to the selection of content for science learning ( $M=2.74$ ). On the other hand, the findings also show low levels of autonomy in terms of the students' perception on the

importance of the class and the teacher in their science learning ( $M=2.25$ ), low level of importance to teacher explanation and supervision ( $M=1.92$ ), low confidence about defining their objectives or intrinsic motivation ( $M=2.24$ ) and find low importance of external assessment in motivating the learners' work ( $M=2.21$ ). Considering students' self-assessed level of autonomy across all the dimensions, the study revealed that they have low level of autonomy of learning in science ( $M=2.451$ ). The overall findings suggest that the third-year education students in the university generally exhibit dependent way of learning.

This runs on contrary on the study of Joshi, [2] which states that learners who have a high level of autonomous learning have the authority to lead themselves in learning and that they have all the means and freedom to select the effective and the appropriate learning manner suited for them because this will later lead them in attaining academic success. However, such notion was refuted by Rezalou [11] and Richards, [12] who posited that not because a learner is self-directed in their learning it does not mean that he is already independent because an autonomous learner is also dependent to those who are knowledgeable like the teachers. Thus, the overall findings of this study were supported by Navarro and Santos [13] stating that in autonomous learning there should be scaffolded by the teachers for the students to be guided and stay motivated in learning especially that we are now in K-12 Curriculum.

### Problem 2. What is the level of metacognitive awareness of the pre-service teachers?

**Table 2. Pre-service teachers' level of metacognitive awareness**

Metacognitive Awareness Scales	Mean	Level of Metacognitive awareness
Motivated Commitment	3.11	High
Responsible Learning	2.99	High
Overall Metacognitive awareness	3.036	High

Table 2 shows the level of metacognitive awareness of the preservice teachers. Findings revealed that, generally,

the pre-service teachers have high levels of motivated commitment ( $M=3.11$ ) and responsible learning ( $M=2.99$ ) in studying science subjects. The overall results showed that the pre-service teachers in the university have high level of metacognitive awareness ( $M=3.036$ ).

These findings imply that the pre-service teachers use high motivated commitment (MC) and responsible learning (RL) metacognitive awareness in studying their science subjects. These results suggest that they often speak, both at home and outside, enthusiastic about their school activities. Likewise, they do not easily give up if they have not finished what they had set out to do even at times they are tired to do so. Correspondingly, before starting to study, they tend to reflect on the meaning of what they are going to learn in order to satisfy their personal interests, they sometimes look for more information about a topic presented during the classes using multimedia resources.

In addition to this, the high level of responsible learning (RL) metacognitive awareness implies that the pre-service teachers try to make connective learning more meaningful through connecting what they study across disciplines whenever possible. They try to relate new concepts to an existing bank of information, accommodating fresh ideas and imagine ways and situations where these could be applied. In the same manner, when they search for a solution to a problem, they try to work out different possibilities, even taking into account technological tools and resources.

The findings of the present study substantiate the findings of Gasner, [14] who found that learners who are aware of their own learning process and studying strategies are likely to have a high academic achievement. Thus, it is important to consider the effective ways of learning for the students to enhance their positive learning habit and heighten their academic achievement. [6] Furthermore, according to Chatzipanteli as cited in Aktag, et al., [1] a

learner who possesses high level of metacognitive awareness tends to behave more strategically and productively, makes plans, organize and monitor their learning better than the learners who are unaware about their metacognition.

**Problem 3. What is the pre-service teachers' level of achievement in science?**

Table 3 shows the level of science achievement of the pre-service teachers.

**Table 3. The pre-service teachers' academic achievement in science subjects**

Grade Point Average in Science	Frequency	Qualitative Description
1.00 to 1.25	1	Outstanding
1.26 to 2.00	29	Very Satisfactory
2.01 to 2.75	54	Satisfactory
2.76 to 3.50	0	Least Satisfactory
3.51 to 4.25	0	Fair
4.26 to 5.00	1	Failed
Mean GPA=2.161 Satisfactory		

It can be observed in Table 3 that 29 preservice teachers (34.1%) have gained very satisfactory performance with GPA ranging from 1.26 to 2.00, while 63.52% of them ( $n=54$ ) have gained satisfactory performance. One student failed and one student had gained an outstanding academic achievement.

The table likewise revealed that the overall academic achievement of the pre-service teachers ( $M=2.161$ ) falls on a satisfactory level of performance. This result underscores that the pre-service teachers have an average level of performance in their science subjects.

**Problem 4. Are there significant relationships between the pre-service teachers' autonomous learning, metacognitive awareness and achievement in science?**

**Table 4. Relationships among pre-service teachers' autonomous learning, metacognitive awareness and academic achievement**

	Autonomous Learning	Metacognitive Awareness
Metacognitive Awareness	0.217	-
Science Academic Achievement	0.046	- 0.450*

\* Correlation was found significant at  $p < .05$   
 Note: Strength of Correlation: very weak (.00-.19); weak (.20-.39); moderate (.40-.59); strong (.60-.79); and very strong (.80-1.0).

Table 4 shows that there is a non-significant and weak correlation between

autonomy and metacognitive awareness ( $r=0.217, p>.05$ ). This finding indicates that the metacognitive awareness of the pre-service teachers in learning science subjects is not significantly related to autonomous learning. This suggests that students' metacognitive awareness in learning is not dependent on their autonomy in learning. It can also be observed in the table that there is no significant correlation between respondents' autonomy and their academic achievements ( $r=0.046, p>.05$ ). This finding indicates that the autonomous learning of the pre-service teachers is not significantly related to their academic achievement and that the relationship between the two constructs is very weak. This implies that one may succeed academically either by an independent learner or being a learner who chooses to work within a group and under the guidance of authorities such as teachers and peers.

The table also reveals that there is a significant and moderate correlation between pre-service teachers' metacognitive awareness and academic achievement ( $r= -0.450, p<.05$ ). Nonetheless, it must be noted that the negative value of  $r$  shows that as the metacognitive learning awareness of the respondents increases, their grade point average lowers (i.e. grade becomes higher). This implies that there is a positive relationship between a heightened level of metacognition and higher achievement in science. Even though this investigation does not venture on the testing of causal relationship between the variables, the evidence shows that the academic achievement of pre-service teachers and their metacognitive awareness in learning are related. Hence, it can be deduced that improving pre-service teachers' metacognitive learning awareness may likewise improve the academic performance of the students in science, or vice versa.

It was observed that the autonomy and metacognitive awareness have positive but non-significant interplay; the same result is articulated in the findings of Hashemian, [16] which capitalizes that even

though the learner is motivated it does not affect the level of his autonomy. This however is in contrast with the study of Song, Song, Cao and Yang [17] foregrounding that there is a significant role in having high cognitive abilities in achieving high academic performance in terms of their autonomous learning.

The result of the relationship of academic achievement and metacognitive awareness is similar to the findings of Squier, [18] which posited that the learners' high level of metacognitive awareness is relevant in enhancing student's learning and their academic achievements. This was also related to the statement of Gaylo and Dales, [6] which reiterates that the inclusion of metacognitive awareness in the classroom is recommended to help students learn more effectively since this could help them. Furthermore, learners who are more conscious on how they learn can improve how they accumulate knowledge which brings an opportunity for the learner to plan. [1] They could also be able to sequence and monitor their learning in a way that improves their academic achievement.

**Problem 5. Are there significant relationships among the pre-service teachers' achievement in science and the different dimensions of metacognitive awareness?**

The dimensions of metacognitive learning strategies have reflected significant correlations with the pre-service teachers' academic achievement. The result is shown in Table 5.

**Table 5. Relationships between the different dimensions of metacognitive awareness and the pre-service teachers' science academic achievement**

Metacognitive Awareness Dimensions	Science Academic Achievement
Motivated Commitment (MC)	- 0.215*
Responsible Learning (RL)	- 0.495**

\* Correlation was found significant at  $p<.05$ \*\* Correlation was found significant at  $p<.005$

Note: Strength of Correlation: very weak (.00-.19); weak (.20-.39); moderate (.40-.59); strong (.60-.79); and very strong (.80-1.0).

The respondents' motivated commitment (MC) metacognitive awareness had shown a significant positive, but weak

relationship with their academic achievements ( $r = -0.215$ ,  $p < .05$ ). On the other hand, their responsible learning (RL) metacognitive awareness had a moderate and highly significant positive relationship with the achievements ( $r = -0.495$ ,  $p < .005$ ). These findings suggest that higher levels of metacognitive learning awareness could lead to higher grades in science-related subjects.

The result gathered likewise supports the idea of Chatzipanteli as cited in Aktag, et al., [15] who posits that a learner who possesses high level of metacognitive awareness tends to behave more strategically and productively, make plans, organize and monitor their learning better than the learners who are unaware about their metacognition. Furthermore, students who are aware of their own thinking have higher achievement than the students who are unaware of their own metacognition.

## CONCLUSION

The pre-service teachers have a low level of autonomy in learning which means that, generally, they have dependent way of learning. Their autonomy has no significant correlation with their academic performance. The other hand, their metacognitive awareness shows significant correlation with their academic performance. Since the result reveals that the pre-service teachers learn more when they are all assisted, the pre-service teachers should be given more activities wherein they can work together to achieve tasks. For an instance, the teacher could give activities, namely Think, Pair and Share technique, Peer Tutoring, dyads and triads grouping and other strategies that the teacher could device to engage the learners to work together. Teachers may also provide activities and drill where the students can work dependently and independently to exercise the students' learning styles and choices in learning. The pre-service teachers could also be given activities such as film and movie reaction papers, journal critiquing and writing and writing reflection

papers that encourage and indulge them to read, reflect and draw meaningful conclusions. These could help them nurture their metacognitive awareness because improving one's metacognition yields to a positive result.

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