An Analytical Study on the Impact of Cognitive Styles on Academic Performance among Grade 12 Students in Northern Samar

**Abstract:** This study examined the impact of Cognitive Styles on the academic performance of Grade 12 senior high school students across Northern Samar, Philippines, during the school year 2023-2024. A detailed correlation analyses were performed to determine the relations between multiple facets of cognitive styles and academic performance in this study. This study used a quantitative method by gathering and analyzing data on academic performance by incorporating surveys and general weighted average (GWA) to collect and analyze data pertaining to academic performance. Results from the study showed that different cognitive styles—like the Systematic and Integrated styles, which support holistic learning—had a significant impact on academic performance. This highlights the importance of instructional strategies that accommodate a range of learning preferences. Furthermore, this provides a comprehensive analysis of the academic cognitive styles exhibited by Grade 12 senior high school students in the Division of Northern Samar. These insights underscore the importance of implementing tailored instructional strategies in senior high school contexts to address individual cognitive differences and foster more educational practices. To help students reach their full potential, the study's findings contribute to the growing body of research that supports the use of individualized learning.

**Key Words:** cognitive processing,systematic styles, integrated styles, dynamic interactions, cognitive strategies

1. INTRODUCTION

The Senior High School (SHS) program was first introduced in 2016 in the Philippines as part of the K to 12 Basic Education Program, aiming to align the country’s education system with international standards (Department of Education [DepEd], 2016). It aims to prepare students for higher education, employment, and entrepreneurship by teaching them the core curriculums and specialized tracks aligned to their chosen career paths (DepEd, 2016; Deysolong, 2023). However, despite these objectives, studies and national assessments shows that the program has struggled to achieve its intended outcomes.

Students' continuously poor academic performance is one of the SHS program's biggest problems. According to a 2020 Manila Times article, SHS pupils received the lowest scores in history on national exams (Albano, 2020). Albano (2020) argues that a large number of students are deficient in critical thinking, problem-solving, and literacy. The program's weaknesses are further highlighted by regional disparities. With a mean percentage score of 36.40%, Northern Samar grade 12 students were the third least proficient school division in Region VIII (National Achievement Test Results, 2017-2018). Moreover, student retention in the SHS program is also a major problem in addition to the deteriorating academic performance. According to data from the Enhanced Basic Education Information System (EBEIS), as cited in Philippine Statistics Authority (PSA, 2022), dropout rates rose from 3.6% in 2015 to 6.0% in 2020, while the cohort survival rate decreased from 80.3% to 74.0% as of 2020 and the completion rate decreased from 81.8% in 2015 to 74.0% in 2020 (PSA, 2022). These numbers cast doubt on the program's viability and accessibility, especially for pupils from low-income families.

One possible factor to consider in explaining these results is a student’s cognitive style. According to Sternberg (1997), cognitive style refers to a person’s habitual way of learning or processing information. Thus, if a student's cognitive style and the teaching method used does not align with each other, it may impact their comprehension and academic performance.

Moreover, numerous studies have also presented empirical data that support the substantial impact of cognitive strategies on the academic performance of high school students (Peng & Kievit, 2020). According to the study of Garcia and Ramos (2017), there were relationships between cognitive styles and academic performance. It was emphasized in their studies the importance of elaboration, organization, critical thinking, and metacognitive regulation in enhancing academic performance and highlights the negative impact of rote learning. Their findings can be used by educators to design effective teaching and learning strategies that promote the development of cognitive styles and improve student performance.

Cognitive styles refer to individual differences in processing information (Peterson et al., 2009, as cited in Bouckenooghe et al., 2016). Among the various frameworks that characterize cognitive styles, Keen (1973), McKenney and Keen (1974), and Botkin (1974), as cited in Martin (1998), identified two prominent types: (1) systematic style and (2) intuitive style. According to Martin (1998), systematic style refers to the rational behavior that uses a sequential approach to thinking, while intuitive style refers to the spontaneous approach. Thus, systematic style is often viewed positively, while intuitive style is viewed negatively. While systematic and intuitive styles provided the foundation for the Cognitive Style Model, they have not adequately represented the entire spectrum of people’s behavior with regard to thinking, learning, and problem-solving skills, as well as decision-making abilities. As a result, Martin (1983), as cited in Martin (1998), created a multidimensional model that was intended to reflect the entire spectrum of people’s behavior. His model consisted of two continuums: (1) high systematic to low systematic and (2) high intuitive to low intuitive (Martin, 1998). Under this framework, five distinct cognitive styles have been identified. (1) systematic style; (2) intuitive style; (3) integrated style; (4) undifferentiated style; and (5) split style (Martin, 1998).

As previously discussed, systematic style refers to the rational behavior that uses a sequential approach to thinking (Keen, 1973; McKenney & Keen, 1974; Botkin, 1974, as cited in Martin, 1998). In this framework, an individual that is identified as having a systemic style rates high on the systematic scale and low on the intuitive scale (Martin, 1998). Intuitive style, conversely, refers to the spontaneous approach (Keen, 1973; McKenney & Keen, 1974; Botkin, 1974, as cited in Martin, 1998). In this framework, an individual that is identified as having an intuitive style rates low on the systematic scale and high on the intuitive scale (Martin, 1998). Following this, the integrated style emerges as a combination of systematic and intuitive style. An individual that is identified as having an integrated style rates high on both systematic and intuitive style and is able to quickly change styles in a matter of seconds (Martin, 1998). Conversely, undifferentiated style refers to not having a style at all due to having no distinct preferences between systematic style and intuitive style. An individual that is identified as having an undifferentiated style rates low on both systematic and intuitive style (Martin, 1998). Finally, the split style refers to having an equal degree of systematic and intuitive style. An individual that is identified as having a split style rates in the middle range of both systematic and intuitive style (Martin, 1998). Given the diversity of cognitive styles among students, it is essential to recognize that SHS students often failed academically due to a mismatch between their cognitive type and teaching styles employed by teachers. Understanding students; different academic styles allows teachers to recognize their cognitive types and tailor their lessons to them.

With the above-cited studies, the researcher deemed it necessary to find out if cognitive styles could significantly affect the academic performance of the senior high school students in the province. The conduct of this study will help educators to better understand their learners that would lead to an effective identification of appropriate teaching strategies for each type of learner. Moreover, by identifying the strategies which are most effective for different types of learners, it can tailor to teaching methods that would better meet the needs of the SHS students. Hopefully, the program to be proposed at the end of the study would lead to an improved academic performance of the students.

*1.1 Objectives of the Study*

Generally, this study sought to investigate the effect of cognitive styles on the academic performance of grade 12 senior high school students.

Specifically, it aimed to:

1. determine the extent of practice of cognitive styles of senior high school students in terms of:

1.1. Systematic Style,

1.2. Integrated Style,

1.3. Undifferentiated Style,

1.4. Intuitive Style,

1.5. Split Style;

2. determine the academic performance of the senior high school students in the Division of Northern Samar,

3. find out if there is a significant relationship between the cognitive styles of the senior high students and their academic performance.

2. METHODOLOGY

*2.1 Locale of the Study*

The study was conducted in the Division of Northern Samar. The division is composed of 46 districts located across 24 municipalities with Catarman as its capital, and divided into three geographical areas: the Balicuatro Area, Pacific Area and Central Area.

The specific locale of this study are the public senior high schools in the division distributed to the three geographical areas of the province. Specifically, the schools to be included in the Pacific Area are: Pambujan NHS/SHS, Gamay NHS/SHS, Sumoroy AIS SHS, Catubig Valley NHS/ SHS, Laoang NHS/SHS, Las Navas NHS/SHS. The Central Area will include: Catarman NHS/SHS, San Jose Technical High School NHS/SHS, Bobon School for Philippine Craftsmen, Mondragon AIS/SHS, Lope de Vega SHS, Don Juan F. Avalon SHS. Balicuatro Area senior high schools will include Victoria NHS/SHS, Capul AIS/SHS, Allen NHS/SHS, BBCMAIS SHS, Biri NHS/SHS, San Isidro NHS/SHS

The foregoing schools are the secondary schools of the Division of Northern Samar offering Senior High School Program from grade 11 to grade 12, school year 2023 – 2024. They further offer academic track with three strands namely General Academic (GA); Humanities, Education, Social Sciences (HUMSS); and Technological, Vocational and Livelihood (TVL).

*2.2 Research Design*

The study employed the descriptive correlational research design. It described the cognitive styles and academic performance of the senior high school students in the province of Northern Samar. In addition, correlational research design was utilized to establish the relationship between cognitive styles and academic performance of SHS students.

*2.3 Population and Sampling*

This study included 366 grade 12 SHS students in the Division of Northern Samar. The representative sample of senior high schools for this study was obtained by using a purposive sampling technique. For better distribution, the researcher first picked 18 senior high schools out of 60 from three (3) areas covering Balicuatro, Pacific, and Central to represent the entire Northern Samar Division. A proportionate sampling technique was then used to distribute the respondents of the study among the 18 schools. This means that schools with bigger populations had a higher number of samples compared to schools with smaller populations. A systematic random sampling technique was then used to select the students from each school. This involved randomly selecting a starting point from the list of students in each school and then selecting every nth student on the list until the required sample size was reached.

*2.4 Respondents*

The number of respondents of the study were 366 Grade 12 students officially enrolled under academic tracks: General Academic (GA), Humanities, Education, Social Sciences (HUMSS), and Technological, Vocational and Livelihood (TVL) for the school year 2022-2023.

*2.5 Variables*

This study has two main groups of variables – independent variables and dependent variables. The independent variable of this study is the cognitive styles of the senior high school students. Cognitive styles were determined in terms of systematic style, integrated style, undifferentiated style, intuitive style, and split style. The dependent variable of this study is the academic performance of the senior high school students which was measured through their grand weighted average. Grand weighted average (GWA) is used in the Department of Education to assess a student's overall academic performance.

*2.6 Research Instruments*

The instrument used to measure the cognitive styles of the respondents consisted of a 25-item inventory adapted from the study conducted by Martin (1998).

*2.7 Validation of Instruments*

The study's instrument underwent rigorous validation procedures to ensure its relevance and appropriateness for the local context. Educational experts in senior high school education critiqued the instrument, which was adapted from foreign sources, to establish content validity. To tailor it to local respondents, some statements were revised. Three (3) senior high school coordinators evaluated the items for their appropriateness and comprehension level, contributing to the refinement of the instrument for use in the study. Each item was judged as either “accept”, “reject”, or “revise”, and all recommendations and suggestions were considered for finalizing the instrument. Subsequently, the finalized instrument was administered to 30 students at Eladio T. Balite Memorial School of Fisheries, ranked 7th based on the number of strands offered.

The results of the reliability analysis showed Cronbach’s alpha coefficients of α=0.82, α=0.88, and α=0.84 for cognitive styles. These figures suggest that the instruments were highly reliable in measuring the given constructs.

*2.8 Data Gathering Procedure*

The researcher asked permission to conduct the study from the school’s division superintendent. Then, after the researcher’s request was approved, the questionnaires were immediately distributed to the respective senior high school students. In the administration of questionnaires, the original English survey instrument was translated orally in Filipino for clarity while maintaining conceptual equivalence. The researcher personally distributed and retrieved the questionnaires to the school identified in this study. She sought the help of the adviser to identify the selected respondents. The general weighted average (GWA) of the respondents was also requested from the advisers to measure the academic performance of the respondents

*2.9 Statistical Treatment of Data*

The data gathered were tabulated, analyzed and interpreted statistically using appropriate statistical tools. The frequency counts, weighted means, and percentage were used for the descriptive parts. The cognitive styles and General weighted average (GWA) were computed using the weighted mean and described based on the different descriptors of the Likert scale. Furthermore, Pearson correlations were used to test for a significant relationship between cognitive styles and academic performance. The Statistical Package for the Social Sciences (SPSS 16) software was used in all statistical analyses and a 5% margin of error was assumed in all hypothesis testing.

3. RESULTS

*3.1 Cognitive Styles of Senior High School Students*

Table 1. Systematic Style

|  |  |  |
| --- | --- | --- |
| Systematic Style | Weighted  Mean | Interpretation |
| I prefer to analyze information logically and step-by-step. | 4.04 | Highly utilized |
| I rely on rules and procedures for decision-making. | 3.96 | Highly utilized |
| I approach problem-solving in a structured way. | 3.83 | Highly utilized |
| I use a systematic approach when learning new information. | 3.82 | Highly utilized |
| I break down complex problems into smaller parts. | 3.49 | Highly utilized |
| Mean | 3.83 | Highly utilized |

Table 2. Integrated Style

|  |  |  |
| --- | --- | --- |
| Integrated Style | Weighted  Mean | Interpretation |
| I enjoy exploring new ideas and possibilities. | 3.96 | Highly utilized |
| I enjoy finding connections between different ideas. | 3.94 | Highly utilized |
| I like to understand the big picture before getting into details. | 3.89 | Highly utilized |
| I use creativity to solve problems. | 3.72 | Highly utilized |
| I think holistically, rather than analytically. | 3.58 | Highly utilized |
| Mean | 3.81 | Highly utilized |

Table 3. Undifferentiated Style

|  |  |  |
| --- | --- | --- |
| Undifferentiated Style | Weighted mean | Interpretation |
| I use different methods to learn new information. | 3.84 | Highly utilized |
| I adapt my cognitive style to the situation. | 3.52 | Highly utilized |
| I use a mix of cognitive styles for problem-solving. | 3.50 | Highly utilized |
| I am comfortable switching between cognitive styles. | 3.45 | Highly utilized |
| I don't have a preferred way of processing information. | 3.21 | Utilized |
| Mean | 3.51 | Highly utilized |

Table 4. Intuitive Style

|  |  |  |
| --- | --- | --- |
| Intuitive Style | Weighted mean | Interpretation |
| I trust my instincts when making decisions. | 3.83 | Highly utilized |
| I rely on gut feelings for problem-solving. | 3.58 | Highly utilized |
| My first impression is often correct. | 3.48 | Highly utilized |
| I make decisions based on limited information. | 3.47 | Highly utilized |
| I prefer intuition over logic. | 3.30 | Utilized |
| Mean | 3.53 | Highly utilized |

Table 5. Split Style

|  |  |  |
| --- | --- | --- |
| Split Style | Weighted mean | Interpretation |
| Using a mix of styles helps me make better decisions. | 3.75 | Highly utilized |
| I use both structured and creative approaches. | 3.65 | Highly utilized |
| I combine different methods for problem-solving. | 3.56 | Highly utilized |
| I adapt my cognitive style to the task. | 3.54 | Highly utilized |
| I use both analytical and intuitive cognitive styles. | 3.48 | Highly utilized |
| Mean | 3.60 | Highly utilized |

Table 6. Summary of Cognitive Styles

|  |  |  |
| --- | --- | --- |
| Cognitive Styles | Mean | Interpretation |
| Systematic Style | 3.83 | Highly utilized |
| Integrated Style | 3.81 | Highly utilized |
| Undifferentiated Style | 3.51 | Highly utilized |
| Intuitive Style | 3.53 | Highly utilized |
| Split Style | 3.60 | Highly utilized |
| Grand Mean | 3.66 | Highly utilized |

*3.2 Academic Performance of the Senior High School Students*

Table 7. Academic Performance of SHS Students

|  |  |  |
| --- | --- | --- |
| Academic Performance of SHS Students | Frequency | Percent |
| With Highest honors (98%-100%) | 2 | 0.55 |
| With High honors (95%-97%) | 24 | 6.56 |
| With honors (90%-94%) | 126 | 34.43 |
| Very Satisfactory (85%-89%) | 142 | 38.80 |
| Satisfactory (75%-84%) | 72 | 19.67 |
| Total | 366 | 100.00 |

*3.3 Relationship between the Cognitive Styles of the Senior High Students and their Academic Performance*

Table 8. Relationship between the Cognitive Styles of the Senior High Students and their Academic Performance

|  |  |  |
| --- | --- | --- |
| Cognitive Styles | Parameters | Academic Performance |
| Systematic | Pearson Correlation | 0.309\* |
| Sig. (2-tailed) | 0.0444 |
| Interpretation | Significant |
| Integrated | Pearson Correlation | 0.501\*\* |
| Sig. (2-tailed) | 0.00 |
| Interpretation | Significant |

\*. Correlation is significant at the 0.01 level (2-tailed).

4. DISCUSSION

*4.1 Cognitive Styles of Senior High School Students*

*Systematic Style*

Table 9 shows that in Northern Samar, the senior high school students’ cognitive styles have an average mean score of 3.83, which is actually used within the surveyed group. Students showing systematic style analyze the information logically and step by step (4.04). They rely on rules and procedures in decision-making (3.96), and problems are solved in a structured way (3.83). Also, they wish to have a systematic approach to learning new things (3.82) and break big problems into components (3.49). This has been further supported in Sternberg & Zhang (2014) in their study on cognitive style, that the systematic cognitive style for individuals does mean an inclination to emphasize organization, structure, and analytical thinking over their own cognitive processes.

*Integrated Style*

Results from the study shows that Integrated style is highly utilized within the surveyed population, revealing an overall mean score of 3.81. Students exhibiting an Integrated Style were found to demonstrate a preference for exploring new ideas and possibilities (3.96) and enjoy finding connections between different concepts (3.94). They tend to prioritize understanding the big picture before getting into details (3.89) and use creativity as a means to solve problems (3.72). These students show holistic thinking patterns rather than thinking analytically (3.58). These results align with studies on cognitive styles, which suggests that individuals with an Integrated Style tend to perform well in tasks that require creativity, innovation, and a broad understanding of complex concepts (Zhang & Sternberg, 2015).

The consistently high mean scores on all statements imply a widespread and uniform use of the Integrated Style among the senior high school students in Northern Samar. This cognitive approach likely facilitates their capacity to tackle challenges through creativity, identify links between varied ideas, and understand how ideas fit within the larger picture that further drives their cognitive agility and problem-solving skills.

*Undifferentiated Style*

Results from the study shows that Undifferentiated style is highly utilized within the surveyed population, revealing an overall mean score of 3.51. Students exhibiting an Undifferentiated Style were found to use different methods to learn new information (3.84). They can easily adapt their cognitive style according to the demands of the situation (3.52) and can use a combination of cognitive styles for solving problems (3.50). Results from the study shows that they can easily switch between different cognitive approaches (3.45) and do not have a preferred way of processing information (3.21). These results align with studies on cognitive styles, which suggests that individuals with an Undifferentiated Style are often skilled in adapting to diverse learning environments (Dunn et al., 1998).

*Intuitive Style*

Results have shown that students in this cognitive approach are highly utilized with an overall mean score of 3.53. It demonstrates that the students' Intuitive Style rely significantly on their instincts and gut feelings when making decisions (3.83). They showed their tendency to trust their initial impressions, considering them often correct (3.48), and prefer using intuition over logic (3.30). Moreover, they indicate an inclination to make decisions based on limited information (3.47). It implies that students made their decision-making according to their instinct behavior rather than their careful actions . This supports the study of Kahneman & Klein, (2009), that intuition is important in certain situations, such as time-sensitive scenarios or when faced with ambiguity. It is important to understand the limitations of depending on intuitive procedures, especially in situations needing logical thinking and critical analysis.

*Split Style*

Results from the study shows that Undifferentiated style is highly utilized within the surveyed population, revealing an overall mean score of 3.60. Students exhibiting an Undifferentiated Style were found to use a mix of styles to make decisions (3.75) and prefer to use a combination of structured and creative approaches (3.65). They tend to combine different methods for problem solving (3.56) and can easily adapt their cognitive style based on the task at hand (3.54). Moreover, it was found that they can use both analytical and intuitive cognitive styles (3.48). According to O'Reilly & Chatman (1996), such flexibility can facilitate a more comprehensive understanding of complex issues and contribute to effective decision-making in diverse contexts.

*Summary of Cognitive Styles*

The cognitive styles assessment reveals that all styles are highly utilized among the surveyed population, with a grand mean score of 3.66, indicating a strong preference across the board. Systematic Style (3.83) and Integrated Style (3.81) show a great disposition towards structural learning or holistic approaches to problems. This means that students have a tendency towards logical analysis and creative ways of thinking, demonstrating their capacity to approach academic work systematically and holistically. Both the Undifferentiated Style (3.51) and Intuitive Style (3.53)on the other hand indicate a form of versatility in the way the students approached the cognitive process, either as an even apparent adaptability to the previous situation or as a gut-feeling way of decision making. Finally the Split Style which has a mean score of 3.60 suggests a balanced use of both structured and creative approaches, revealing a tendency to use a combination of cognitive styles to optimise problem solving. Overall,Overall, the results imply that the surveyed population employs a variety of cognitive styles effectively, demonstrating adaptability and versatility in their learning and problem-solving processes.

*4.2 Academic Performance of the Senior High School Students*

Table 5 shows the academic performance of senior high school pupils, which shows a wide spectrum of success depending on different degrees of proficiency. Of the 366 pupils assessed, most show excellent performance—34.43% earning honors, followed by 38.80% reaching a very decent level of performance. In the 95%-97% grade level, specifically, 6.56% of the students received high honors, therefore demonstrating extraordinary academic excellence. With grades ranging from 98% to 100%, 0.55% of students also set themselves apart by attaining the highest honors, therefore reflecting great intellectual ability. Moreover, a good number of students—19.67%—achieved a satisfactory level of performance, which reflects their capacity to meet academic criteria with competence. Furthermore, 72 students—19.67% of the total—achieved marks falling within the acceptable range, proving competency in all aspects of their academic work. Such diversity underscores the importance of recognizing and supporting individualized learning pathways to foster continued growth and success (Tomlinson, 2014).

*4.3 Relationship between the Cognitive Styles of the Senior High Students and their Academic Performance*

This section presents a positive correlation between the systematic cognitive style and academic success (r = 0.309, p = 0.00444). The study shows the importance of critical thinking and organize approach to education in accordance with the observed positive correlation. This is in line with the results of Zhang and Sternberg (2015), who underlined that students who favor analytical thinking could excel in academic activities requiring logical reasoning, organization, and step-by-step problem-solving strategies, thus contributing to their whole academic performance.

Likewise, the strong positive connection seen for the integrated cognitive style and academic performance (r = 0.501, p = 0.001) supports research implying that holistic and creative thinking patterns are fit for academic achievement (Zhang & Sternberg, 2015). Students with an integrated cognitive style might excel on assignments requiring creative ideas, multidisciplinary approaches, and the capacity to see links between several ideas, therefore improving their whole academic performance.

On the other hand, the non-significant associations seen for the undifferentiated (r = 0.111, p = 0.542), intuitive (r = 0.189, p = 0.724), and split type (r = -0.151, p = 0.724) cognitive styles imply that these preferences may not directly affect academic achievement in this situation. Although students might show flexibility in their approach to learning and problem-solving, other elements such as motivation, study habits, and instructional support could affect their academic success (Dunn & Dunn, 2018).

The correlation study emphasizes overall the complicated interaction between cognitive styles and academic achievement, therefore stressing the need for recognizing individual variations in learning preferences while developing instructional strategies and interventions. Teachers can establish inclusive learning environments that maximize students' potential and support academic success by appreciating and allowing several cognitive styles in their approaches.

5. CONCLUSIONS

Northern Samar SHS students show a great variety of cognitive styles. Some students are systematic and structured in their thinking while others prefer holistic and intuitive methods. The different academic performance among senior high school students emphasizes the need of recognizing individual strengths and areas for improvement. Although some show good performance, others show satisfactory performance, showing the need for tailored intervention strategies. The significant positive correlations imply that academic performance is influenced favorably by structured, analytical thinking (systematic) and comprehensive, creative thinking (integrated). On the other hand, none of the versatile learning approaches (Undifferentiated, Intuitive, and Split Type) showed significant correlations, which means that cognitive style versatility might not have a direct relationship with academic performance. When students engage in both types of thinking, it emphasizes the rationale for combining it in educational environments to broaden the journey of how we learn to provide students with the best opportunities to be academically successful.

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