

Impact of W3Schools on Aiding BSCS Students at SNSU in Learning Programming Languages

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Abstract: *This study examined the impact of W3Schools on aiding Bachelor of Science in Computer Science (BSCS) students at Surigao del Norte State University in learning programming languages. Using a descriptive-correlational research design, the study investigated how W3Schools tutorials, exercises, and ease of access influenced students' understanding of programming concepts, programming skills, and overall learning experience. A total of 60 first-year BSCS students participated in the study. Findings revealed that Ease of Access had obtained the highest mean, indicating that students highly valued the platform's flexibility. Spearman's rho showed very high, statistically significant relationships ($p < 0.001$) between platform use and learning outcomes in conceptual understanding, skills, and experience*

Keywords: W3Schools, Programming education, E-learning, Programming skills, Online learning platforms, BSCS students.

I. INTRODUCTION

W3Schools is a popular web learning platform that offers tutorials, examples, and practice codes for different programming languages like Python, Javascript, and C++. We conducted this study to explore how W3School can help BSCS students at Surigao del Norte State University improve their programming skills and make learning easy, accessible for them, and more effective.

The rapid growth of e-learning technologies has significantly influenced the evolution of education, including programming education that depends on practical activities and timely feedback. Despite this, many students experience difficulties with traditional instructional methods as they often fail to ensure active engagement or provide detailed, concept-focused support. (Alghandi, 2025). Limited resources, computer files that are easily erased, and poor academic performance were among the issues that were found to contribute to students' lacking competence. (Lumogdang et al., 2021). The traditional learning environment has evolved as a result of technology's implementation into education, providing both teachers and students with new options. Online learning systems, which provide flexibility, accessibility, and individualized learning experiences, have become effective instruments for facilitating learning from home. (Himanshu et al., 2026). Online learning platforms are essential for giving people access to a variety of learning programs and opportunities, allowing their knowledge and abilities to improve. (Zahoor et al., 2025). Additionally, according to Dhori et al. (2025), using a digital platform in education involves including online education as a learning aid. One of the factors that needs to be considered is how students engage with the online learning environment.

Despite these findings, existing research largely focuses on the general effectiveness of online learning platforms and digital education tools, with limited attention given to specific web-based platforms used for programming instruction. There is insufficient empirical evidence on how platforms like W3Schools support programming skill development, particularly in terms of understanding, skill development, and learning effectiveness among BSCS students in SNSU.



Moreover, few studies examine student engagement and learning outcomes in the context of freely accessible, self-paced programming platforms.

To address this gap, the proposed solution of this study is to systematically examine the use of W3Schools as a supplementary learning platform and determine its effect on students' understanding of programming concepts and learning experience. By focusing on a specific platform, this study responds to the lack of platform-centered research and provides data-driven insights into how self-paced, web-based resources support programming skill development. The study also addresses the gap in literature concerning student engagement and learning outcomes within freely available, non-institutional online platforms.

The contribution of this study is threefold. First, it contributes to the existing body of knowledge by providing empirical evidence on the effectiveness of W3Schools in improving programming understanding among BSCS students. Second, it offers practical implications for instructors by identifying how web-based platforms can complement traditional teaching methods and address limitations such as limited resources and time constraints. Third, it benefits educational institutions, particularly SNSU, by informing decision-makers about cost-effective learning support tools that can enhance programming education. By addressing these gaps, the study helps prevent continued learning deficiencies and supports the development of more effective and inclusive programming instruction.

Objectives of the Study

- This study aims to determine the impact of W3Schools as a supplementary learning platform in aiding BSCS students at Surigao del Norte State University in learning programming languages.
- Determine the level of students' use of W3Schools in learning programming languages;
- Assess the effectiveness of W3Schools in improving students' understanding of programming concepts;
- Evaluate the contribution of W3Schools to the development of students' programming skills;
- Examine the influence of W3Schools on students' learning experience in terms of accessibility, ease of use, and learning effectiveness; and
- Identify the overall impact of W3Schools as a supplementary learning tool for BSCS students at SNSU.

II. REVIEW OF RELATED LITERATURE

Programming education had become an essential component of Computer Science programs because it developed students' logical thinking, problem-solving abilities, and technical skills. However, many students had experienced difficulties in learning programming languages because of the complexity of syntax, debugging, and algorithmic thinking. With the growth of technology and online learning, web-based learning platforms such as W3Schools had become widely used as supplementary learning tools for programming education.

Ease of Access

E-learning platforms had become important tools in programming education because they provided flexible schedules and personalized learning experiences that allowed students to study at their own pace. According to Alghambi and Yahya (2025), platforms such as W3Schools were valued for their user-friendly interface, flexibility, and clear tutorials, which helped students understand programming concepts more effectively. In addition, Jehwae et al. (2023) explained that online learning platforms provided accessible and regularly updated content that kept learners informed about current programming languages and technologies.

Fonseca et al. (2022) further stated that web-based programming platforms included features such as code linting and error detection that made coding practice easier and more interactive for learners. These tools helped students identify mistakes quickly and improve their understanding of programming syntax and logic. Similarly, Darmanto et al. (2025) emphasized that guided learning and clear instructions improved both engagement and technical skills while promoting responsible use of technology.



Moreover, Alghamdi (2025) found that students who used online learning platforms such as W3Schools showed improvement in coding performance, understanding of programming concepts, and debugging skills. These findings suggested that accessibility and ease of use were important factors that influenced students' learning experiences in programming education.

Exercises

Programming exercises had been important in strengthening students' practical understanding of coding concepts. W3Schools provided interactive coding examples and exercises that enabled learners to practice directly on the platform. According to Jehwae et al. (2023), online coding platforms offered flexibility and opportunities for students to practice anytime and anywhere using different devices.

Alasmari et al. (2024) explained that W3Schools provided theoretical explanations together with practical coding exercises that reinforced students' understanding of programming concepts. Fitra and Anistyasari (2022) also noted that combining online learning tools with classroom instruction created a more effective and flexible learning environment. Additionally, Gomez (2024) stated that free online programming resources such as W3Schools served as accessible entry points for beginners in web development and programming education. The platform's exercise-based learning environment allowed students to apply lessons immediately, improving both retention and practical programming skills.

Learning Experience

W3Schools had been recognized as an effective supplementary learning tool because it encouraged continuous practice and provided immediate feedback. According to Alghamdi (2025), platforms that offered instant responses allowed students to identify coding errors quickly and improve their programming performance. Since W3Schools contained online code editors and real-time examples, learners could test programs directly and explore different coding structures.

Lumogdang et al. (2021) explained that W3Schools focused mainly on web development and introductory programming concepts, making it suitable for beginner programmers. In addition, Susanti et al. (2023) emphasized that students who used e-learning tools became more independent learners because online platforms encouraged self-directed study.

Furthermore, Alamsyah et al. (2025) found that online learning environments improved learner satisfaction by giving students flexible access to educational materials without limitations of time and location. These findings indicated that W3Schools contributed positively to students' confidence, motivation, and overall programming learning experience.

Tutorials

W3Schools had been widely recognized as an accessible and beginner-friendly programming platform. According to Alasmari et al. (2024), the platform provided tutorials, documentation, and code examples for programming and web technologies such as HTML, CSS, JavaScript, Python, and SQL.

Hora (2021) emphasized that W3Schools encouraged interactive learning because students could test and modify code in real time. This hands-on approach allowed learners to immediately apply programming concepts and improve coding comprehension. Alghamdi (2025) further noted that W3Schools simplified complex topics through its organized tutorials and embedded code editors.

Kumar and Singh (2023) reported that many students rated W3Schools highly because of its accessibility, interactivity, and ease of use. Likewise, Lumogdang et al. (2021) explained that example-based tutorials helped beginner learners quickly understand programming concepts, although advanced learners might still require more comprehensive resources.



Programming Skills

Active participation in programming activities had been important in developing coding skills and computational thinking. Hobert (2022) explained through the ICAP framework that interactive engagement enhanced students' understanding and learning outcomes. Similarly, Aung et al. (2024) stated that interactive teaching strategies increased student participation and improved comprehension of complex programming topics.

Ling and Chiang (2022) found that adaptive learning systems designed according to students' needs improved academic performance and addressed common programming difficulties. In addition, Darmansah and Karim (2025) explained that platforms like W3Schools strengthened programming skills through guided coding exercises and step-by-step instructions.

Programming education had also increasingly been introduced at earlier levels of education to improve computational thinking and problem-solving abilities among learners (Oka et al., 2024). These findings supported the idea that online learning tools and interactive programming platforms contributed significantly to students' technical skill development.

Understanding of Concepts

Online learning had become an important innovation in modern education because it used technology to support flexible and interactive learning experiences. According to Syahri et al. (2024), online learning environments helped maintain educational continuity while improving accessibility and adaptability.

Research also indicated that students who learned through technology-enhanced environments demonstrated stronger understanding of programming concepts compared to those who relied only on traditional lectures. Interactive coding tools and online simulations improved student engagement and made abstract concepts easier to understand.

Alghamdi (2025) explained that interactive e-learning tools positively influenced students' programming performance, confidence, and problem-solving abilities. Likewise, Asgari et al. (2024) noted that digital tools made difficult programming concepts such as debugging and algorithm design easier to understand. Katyetova (2023) further emphasized that digital learning platforms improved students' digital literacy and technological competence.

III. METHODS

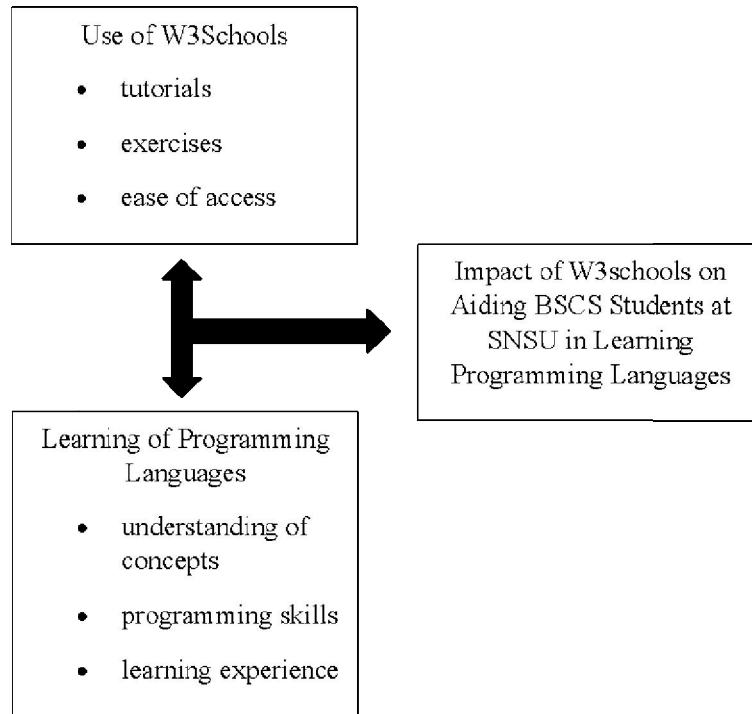
This study utilized a descriptive-correlational research design. The respondents were 60 first-year BSCS students at Surigao del Norte State University (AY 2025–2026). Purposive sampling was used to select participants with prior W3Schools experience. Data were gathered via structured survey questionnaires and analyzed using frequency distribution, weighted mean, standard deviation, and Spearman's Rank Correlation Coefficient.

Conceptual Framework

This study is based on the assumption that the use of W3Schools as a supplementary learning platform influences students' learning of programming languages. The independent variables include tutorials, exercises, and ease of access provided by W3Schools, while the dependent variables include students' understanding of concepts, programming skills, and learning experience.

The framework suggests that the features of W3Schools contribute to improved programming education outcomes among BSCS students.





Research Design

This study utilized a descriptive-correlational research design. The descriptive method was used to determine the level of students' use of W3Schools and its effectiveness in improving understanding of programming concepts, programming skills, and learning experience. Meanwhile, the correlational approach was used to determine the relationship between the use of W3Schools and students' learning outcomes.

This design is appropriate because it allows the researchers to gather measurable information through survey questionnaires and analyzed relationships between variables statistically.

Respondents of the Study

The respondents of the study were first-year Bachelor of Science in Computer Science (BSCS) students enrolled at Surigao del Norte State University during the Academic Year 2025–2026. The participants were selected because they are actively studying programming languages and have experience using W3Schools as a supplementary learning platform.

The researchers used purposive sampling in selecting the respondents. Only students who had prior experience using W3Schools were included in the study. A total of 60 respondents participated in the study.

The criteria for selecting participants were the following: must be a first-year BSCS student at SNSU, must have experience using W3Schools, and must be enrolled in programming-related subjects.

Research Instrument

The researchers used a structured survey questionnaire as the primary instrument for data gathering. The questionnaire was distributed through Google Forms for convenience and accessibility.

The questionnaire consisted of two parts:

Part I – Profile of the Respondents that included demographic information such as: Age, Sex, and Year Level



Part II – Assessment of W3Schools that contained statements related to: Understanding of Concepts, Programming Skills and Learning Experience

The respondents answered the questionnaire using a 4-point Likert Scale

TABLE I. Scale of Interpretation for Likert Responses

Scale	Range	Verbal Description	Interpretation
4	3.50 – 4.00	Strongly Agree	Very High
3	2.50 – 3.49	Agree	High / Moderate
2	1.50 – 2.49	Disagree	Low
1	1.00 – 1.49	Strongly Disagree	Very Low

Data Gathering Procedure

The researchers first secured approval from the research adviser and the administration of Surigao del Norte State University before conducting the study. After obtaining approval, the survey questionnaire was prepared and validated. Qualified respondents were identified based on the established criteria. The questionnaire link was distributed through Google Forms, and respondents were given sufficient time to answer honestly and completely. After data collection, the responses were organized, tabulated, and analyzed to determine the impact of W3Schools on students' learning of programming languages.

Statistical Treatment of Data

The following statistical tools were used in analyzing the gathered data:

Frequency and Distribution Percentage

This statistical tool was used to describe the demographic profile of the respondents in terms of age, sex, and year level.

Formula:

$$\% = (f \div N) \times 100$$

Where:

f = frequency of responses

N = total number of respondents

Weighted Mean

Weighted mean was used to determine the level of impact of W3Schools on students' understanding of concepts, programming skills, and learning experience.

Formula:

$$WM = \Sigma(f \times w) \div N$$

Where:

f = frequency

w = assigned weight

N = total number of respondents

Standard Deviation

Standard deviation was used to determine the consistency and variability of respondents' answers.

Spearman's Rank Correlation Coefficient (Spearman's rho)

This statistical tool was used to determine the significant relationship between the use of W3Schools and students' learning outcomes.



Formula:

$$r_s = 1 - (6\sum d^2) \div n(n^2 - 1)$$

Where:

d = difference between paired ranks

n = number of observations

IV. RESULTS AND DISCUSSION

The findings revealed that students highly value the platform's Ease of Access. Tutorials and exercises were also found to significantly improve conceptual understanding and programming skills. Spearman's rho analysis confirmed very high and statistically significant relationships between the use of W3Schools and students' learning outcomes.

Profile of the Respondents

The study involved 60 first-year BSCS students from Surigao del Norte State University who had experience using W3Schools. In terms of age, most respondents were 19 years old, followed by 18-year-old students. This indicates that the majority of the participants belong to the late adolescent stage. In terms of sex, male respondents slightly outnumbered female respondents. However, both male and female students actively used W3Schools as a supplementary learning platform.

Table 1 shows the distribution of the respondents based on their age group. The data indicates that the majority of the respondents are 18 to 19 years old, which is commonly the age range of first-year Bachelor of Science in Computer Science (BSCS) students. This suggests that most participants are in the early stage of higher education and are currently adjusting to programming-related subjects and digital learning environments. Since the respondents belong to a younger age group that is highly exposed to technology and online platforms, they are more likely to utilize web-based learning resources such as W3Schools in studying programming languages.

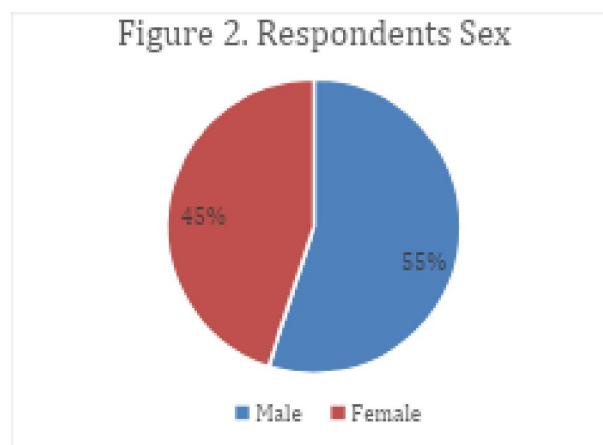
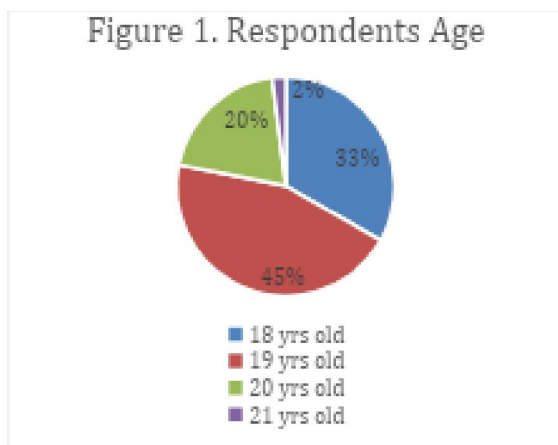
Table 1. Profile of the Respondents

Category	Frequency (n)	Percentage (%)
Age		
18 years old	20	33.33
19 years old	27	45.00
20 years old	12	20.00
21 years old	1	1.67
Sex		
Male	33	55.00
Female	27	45.00
Year Level		
1st Year	60	100.00
Total	60	100.00



The majority of respondents are 19 years old (45%), followed by 18-year-olds (33.33%). Most students are in the typical first-year college age range of 18–19, which is consistent with the study's focus on 1st Year Computer Science students.

Male respondents slightly outnumber females (55% vs 45%). The gap is relatively small, suggesting a fairly balanced sample, though it reflects the common trend of slightly higher male enrolment in Computer Science programs.



Analysis of Learning Factors and Outcomes

Tutorials

The data indicates that W3Schools tutorials strongly support students' understanding of programming concepts, particularly in explaining coding lessons through simple examples and step-by-step discussions. Students also agreed that the tutorials help improve their programming skills and contribute to a more positive learning experience. Overall, the respondents perceived that the tutorials provided by W3Schools positively contribute to their comprehension, coding ability, and confidence in learning programming languages.

Table 2. Level of Impact of W3Schools Tutorials

Indicator	Mean	SD	Interpretation
Understanding of Concepts			
1. Identify the meaning of programming terms more clear.	3.30	0.65	Agree
2. Define the step-by-step process of a program.	3.32	0.63	Agree
3. Confidently explain the lesson.	3.30	0.65	Agree
Sub-mean	3.31	0.64	Agree
Programming Skills			
4. Write simple code.	3.28	0.60	Agree
5. Use appropriate syntax.	3.23	0.55	Agree
6. Solve programming errors.	3.27	0.57	Agree



Sub-mean	3.26	0.57	Agree
Learning Experience			
7. Feel motivated to study code.	3.25	0.77	Agree
8. feel confident when learning codes.	3.25	0.77	Agree
9. Enjoy coding.	3.25	0.77	Agree
Sub-mean	3.25	0.77	Agree
Overall Mean	3.27	0.67	Agree

Under the Understanding of Concepts category, all three indicators received mean scores ranging from 3.30 to 3.32 ($SD = 0.63-0.65$), all interpreted as Agree, resulting in a sub-mean of 3.31. This suggests that students considered W3Schools tutorials effective in helping them understand fundamental programming concepts and syntax. The clear explanations and step-by-step structure of the tutorials likely supported students in developing a solid grasp of programming basics. This finding is supported with Mitharam (2024), who reported that learners perceived W3Schools as a useful and relevant educational resource due to its accessible explanations, ease of use, and wide range of programming language content, all of which contribute to improved conceptual understanding.

For Programming Skills, the sub-mean was 3.26 ($SD = 0.57$), also interpreted as Agree. Students generally agreed that the tutorials enhanced their coding practice and strengthened their problem-solving abilities in programming. Although slightly lower than the Understanding of Concepts score, this result still indicates that tutorials are valuable in improving practical programming skills. This finding supports Hora (2021), who emphasized that W3Schools tutorials promote real-time code testing and correction, enabling learners to actively practice coding and immediately apply programming concepts, thereby reinforcing technical skills through interactive learning.

As for Learning Experience, it got a sub-mean of 3.25 ($SD = 0.77$), the lowest among the three tutorial-related categories, yet still interpreted as Agree. This indicates that students found the tutorials enjoyable, confidence-boosting, and motivating for further learning. The higher standard deviation suggests greater variation in students' perceptions of motivation and enjoyment. This finding is supported by Alamsyah et al. (2025), who noted that digital learning platforms enhance learner satisfaction by providing flexible and accessible learning opportunities beyond traditional time and location constraints.

Overall, the Tutorials dimension achieved a mean score of 3.27 ($SD = 0.67$), interpreted as Agree. This implies that BSCS students at SNSU generally viewed W3Schools tutorials as an effective supplementary learning resource for programming education.

Exercises

The findings revealed that W3Schools exercises effectively improve students' understanding of coding concepts and programming logic. Students agreed that the exercises help them practice coding skills, apply lessons through hands-on activities, and identify mistakes through immediate feedback. The results also suggest that regular practice through online exercises contributes positively to students' problem-solving abilities and overall learning experience.

Table 3. Level of Impact of W3Schools Exercises

Indicator	Mean	SD	Interpretation
Understanding of Concepts			
10. Improve my understanding of codes by practicing.	3.37	0.55	Agree



11. Identify which topics I still don't understand.	3.32	0.54	Agree
12. learn by practicing than just reading.	3.33	0.53	Agree
Sub-mean	3.34	0.54	Agree
Programming Skills			
13. Improve skills by repetition.	3.22	0.64	Agree
14. Become faster at writing codes.	3.20	0.61	Agree
15. Develop better problem-solving skills in tasks.	3.22	0.64	Agree
Sub-mean	3.21	0.63	Agree
Learning Experience			
16. Feel engaged because I'm actively practicing.	3.30	0.56	Agree
17. Feels satisfied when I answer them.	3.28	0.58	Agree
18. Feel confident about my progress.	3.30	0.57	Agree
Sub-mean	3.29	0.57	Agree
Overall Mean	3.28	0.58	Agree

Understanding of Concepts achieved the highest sub-mean among all exercise-related categories at 3.34 (SD = 0.54), interpreted as Agree. This indicates that students believed W3Schools exercises effectively strengthened programming concepts, enhanced memory retention, and provided opportunities to apply knowledge to practical tasks. The lower standard deviation also suggests that students' responses in this area were relatively consistent. This finding is supported by Alghamdi (2025), who reported that interactive e-learning tools, particularly web-based platforms with built-in coding environments and immediate feedback, positively influence students' programming performance, conceptual understanding, and problem-solving abilities.

For Programming Skills, the sub-mean was 3.21 (SD = 0.63), the lowest among all sub-aspects across the three W3Schools features, though still interpreted as Agree. Students generally agreed that exercises improved coding accuracy and promoted critical thinking, but the moderate variability indicates that some students rated the skill-development aspect less favorably. This finding is supported by Darmansah and Karim (2025), who noted that self-directed platforms such as W3Schools, through step-by-step instruction and live coding features, effectively strengthen programming skills and reinforce learning through guided practice.

The Learning Experience sub-aspect obtained a sub-mean of 3.29 (SD = 0.57), also interpreted as Agree. Students viewed the exercises as interactive and rewarding, with successful completion promoting a sense of achievement that motivated them to continue practicing. These results align with existing research emphasizing the value of active learning and immediate feedback in enhancing student engagement. Similarly, Aung et al. (2024) highlighted that interactive teaching strategies significantly increase student participation and improve understanding of complex programming concepts, reinforcing the effectiveness of active learning approaches.

Overall, the Exercises aspect recorded a mean score of 3.28 (SD = 0.58), interpreted as Agree. This suggests that W3Schools exercises are moderately effective in supporting BSCS students' learning, particularly in strengthening their conceptual understanding.



Ease of Access

Among all the assessed learning factors, Ease of Access obtained the highest overall mean. Students agreed that W3Schools is accessible anytime and anywhere, making it easier for them to review lessons, practice coding, and study independently at their own pace. The platform's user-friendly interface and availability across different devices contribute positively to students' programming learning experiences.

Table 4. Level of Impact of W3Schools Ease of Access

Indicator	Mean	SD	Interpretation
Understanding of Concepts			
19. Review lessons anytime I need more explanation.	3.37	0.51	Agree
20. learn easily because I can access materials quickly.	3.33	0.52	Agree
21. Understand topics better because I can study at my own pace.	3.35	0.51	Agree
Sub-mean	3.35	0.51	Agree
Programming Skills			
22. Practice coding more often since the site is readily available.	3.33	0.57	Agree
23. Improve my coding because I can quickly check syntax.	3.28	0.54	Agree
24. Start coding even without waiting for instruction.	3.30	0.56	Agree
Sub-mean	3.30	0.56	Agree
Learning Experience			
25. Feel less stressed because resources are always available.	3.32	0.55	Agree
26. Feel more independent when learning coding.	3.28	0.53	Agree
27. Learn more smoothly by accessing lessons anytime.	3.28	0.54	Agree
Sub-mean	3.29	0.54	Agree
Overall Mean	3.31	0.54	Agree

The Understanding of Concepts aspect under Ease of Access obtained the highest sub-mean across all sections of the study at 3.35 (SD = 0.51). Students strongly agreed that W3Schools is easy to navigate, that its search function helps locate topics quickly, and that it is accessible anytime and anywhere. The low standard deviation reflects high consistency in these responses. This finding is supported by Alghamdi (2025), who noted that platforms such as W3Schools are highly valued for their user-friendly interface, flexibility, and clear tutorials, which make programming concepts easier for students to understand.

Programming Skills under Ease of Access got a sub-mean of 3.30 (SD = 0.56), interpreted as Agree. Students recognized that the platform's free and continuous availability allows them to revisit topics and exercises to build their coding skills. The ability to access learning materials for free is a significant factor in supporting self-learning among students. This finding aligns with Fonseca et al. (2022), who explained that web-based programming platforms such as



W3Schools provide accessible coding tools, including error detection and correction features, which make programming practice more manageable and support continuous skill development.

The Learning Experience sub-mean was 3.29 (SD = 0.54), interpreted as Agree. Respondents acknowledged that the user-friendly design and multi-device compatibility of W3Schools enhance their learning experience and encourage regular use. This finding is supported by Jehwae et al. (2023), who noted that W3Schools provides learners with flexible access to coding practice through examples and up-to-date materials, allowing them to study anytime and anywhere using different devices such as desktops, tablets, and smartphones.

The overall mean for Ease of Access was 3.31 (SD = 0.54), the highest among the three W3Schools aspects assessed. This suggests that the platform's accessibility features are perceived most positively by students, showing how a well-designed, freely accessible online platform can significantly support student learning.

Relationship Between W3Schools Use and Learning Outcomes

The results of Spearman's rho showed very high and statistically significant relationships between the use of W3Schools and students' understanding of concepts, programming skills, and learning experience. This means that students who actively used W3Schools generally reported better learning outcomes in programming education.

Table 5. Spearman's rho Correlation: W3Schools Use and Learning Outcomes

Learning Outcome	Spearman's rho (rs)	p-value	Strength	Decision
Understanding of Concepts	0.9513	< 0.001	Very High	Significant
Programming Skills	0.9020	< 0.001	Very High	Significant
Learning Experience	0.9395	< 0.001	Very High	Significant

As shown in Table 5, all three correlations were statistically significant at $p < 0.001$. The correlation between W3Schools use and Understanding of Concepts was $r_s = 0.9513$, indicating a very high positive relationship. This means that students who engaged more actively with W3Schools tended to report stronger understanding of programming concepts. The tutorials and exercises, which introduce and support concepts, likely contributed to this strong relationship. This finding is supported by Alghamdi (2025), who reported that students using W3Schools and similar e-learning resources demonstrated significant improvements in their understanding of programming concepts, coding performance, and error detection skills.

The correlation between W3Schools use and Programming Skills was $r_s = 0.9020$, interpreted as a Very High Correlation. This suggests that students who frequently used W3Schools showed greater improvement in programming abilities. The coding exercises and practical examples may have contributed to skill development, supporting previous studies that interactive and hands-on programming environments improve students' learning and programming concepts (Hijón-Neira et al., 2021).

The relationship between W3Schools use and Learning Experience was $r_s = 0.9395$, classified as a Very High Correlation. Students who engaged more with W3Schools also showed more positive learning experiences, including increased confidence, motivation, and enjoyment in programming. This is supported by Öztürk (2022), who found that self-regulated learning strategies can positively enhance students' motivation and academic performance.

Overall, the results indicate that the use of W3Schools has a very high and statistically significant relationship with all three learning outcomes among BSCS students at SNSU. These findings suggest that W3Schools is an effective supplementary tool that supports not only students' comprehension but also skill-building and affective engagement in learning programming languages.



V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This study examined the impact of W3Schools on aiding Bachelor of Science in Computer Science (BSCS) students at Surigao del Norte State University (SNSU) in learning programming languages. Specifically, it sought to: (1) describe the demographic profile of the respondents; (2) assess the level of impact of W3Schools in terms of tutorials, exercises, and ease of access as perceived by 1st year BSCS students; and (3) determine the significant relationship between the use of W3Schools and students' learning outcomes in terms of understanding of concepts, programming skills, and learning experience.

The study used a descriptive-correlational research design. A total of 60 first-year BSCS students at SNSU who had experience using W3Schools participated as respondents. A researcher-made survey questionnaire with a 4-point Likert scale was used to collect data. Spearman's Rank Correlation Coefficient was used to determine the relationship between W3Schools use and learning outcomes.

The following are the key findings of the study:

Regarding the profile of the respondents, the majority were 19 years old (45.00%), followed by those who were 18 years old (33.33%), 20 years old (20.00%), and 21 years old (1.67%). In terms of sex, male respondents comprised 55.00% of the total, while female respondents accounted for 45.00%. All 60 participants were enrolled in the first year of the BSCS program.

Regarding the level of impact of W3Schools, all three features—tutorials, exercises, and ease of access—were rated as having a positive impact on students' learning, with overall means of 3.27, 3.28, and 3.31, respectively, all interpreted as Agree. Among the three features, Ease of Access obtained the highest overall mean, indicating that the platform's availability and accessibility were perceived most favorably. Across all features, Understanding of Concepts consistently received the highest sub-means, while Programming Skills received the lowest.

Regarding the relationship between the use of W3Schools and learning outcomes, Spearman's rho revealed very high and statistically significant correlations for all three outcomes: Understanding of Concepts ($r_s = 0.9513$, $p < 0.001$), Programming Skills ($r_s = 0.9020$, $p < 0.001$), and Learning Experience ($r_s = 0.9395$, $p < 0.001$). These results indicate that students who engaged more with W3Schools tended to report better learning outcomes across all measured dimensions.

Conclusions

Based on the findings of the study, the following conclusions are drawn:

The majority of respondents were late adolescent learners, with most being 19 years old. The nearly equal distribution between male and female respondents suggests that W3Schools is utilized as a supplementary learning resource regardless of sex, reflecting broad applicability across different student demographics.

W3Schools has a positive impact on 1st year BSCS students' learning of programming languages in terms of tutorials, exercises, and ease of access. Among the three features, Ease of Access was perceived as the most beneficial, suggesting that the platform's free availability, self-paced learning structure, and multi-device compatibility are particularly valued by students. The consistent agreement across all indicators affirms that W3Schools serves as an effective supplementary tool in supporting programming education.

There is a significant relationship between the use of W3Schools and students' learning outcomes in all three dimensions: Understanding of Concepts, Programming Skills, and Learning Experience. The very high correlations confirm that more active engagement with W3Schools corresponds to better self-assessed learning outcomes. This establishes W3Schools not only as a convenient resource but as one meaningfully associated with students' academic development in programming.



Recommendations

Based on the conclusions drawn from this study, the following recommendations are offered:

BSCS students are encouraged to use W3Schools as an additional learning tool, especially its tutorials and coding exercises, to better understand lessons discussed in class. Since the platform is free and self-paced, students can practice coding anytime to improve their knowledge and programming skills.

Faculty members and instructors are encouraged to include W3Schools as a supplementary learning platform in their subjects, particularly in beginner programming courses. Teachers may give tutorials or exercises from the platform as extra activities to support classroom discussions and promote self-learning.

School administrators and program heads are encouraged to support the use of free online learning platforms like W3Schools in the BSCS program. They may organize orientations, awareness programs, or e-learning activities to help students learn how to use these platforms effectively for their studies.

Future researchers are encouraged to conduct similar studies with a larger and more varied group of participants, including students from higher year levels or different courses, to get more general results. They may also compare different online programming platforms to determine which ones are more effective for different learning goals. In addition, future studies may use longer periods of observation to better understand the long-term effects of these platforms on students' learning and programming skills. pursued to assess the long-term impact of W3Schools use on students' actual programming performance and academic achievement.

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