

# Awareness and Effectiveness of Students in Language Programming in a Selected University in China: Towards an Instructional Improvement

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**Abstract:** *The study confined in the Guilin University of Electronic Technology in China. The respondents assessed the awareness of students on the C language programming in terms of Learning ability and Problem solving skills. And the effectiveness of students on the C language programming in terms of Application of coding standards and Coding techniques. The studies are limited to 180 students broken down as follows: automotive students 60; automotive students 60; and Communication student 60. Based on the results and findings of this study the following recommendation proposed by the researcher: a) Create an ideal learning environment where students have the freedom to explore avenues for learning. b) Use of application python rails written in Ruby to develop the programming skills of the students. c) Enhance the debugging skills of students to help them identify and fix issues on programming language. d) Employ SOLO (Structure of Observed Learning Outcomes) for the students to build their learning and thinking.*

**Keywords:** C language; awareness; effectiveness

## 1. Introduction

C languages is the one of most powerful general-purpose programming languages and being the compulsory subject in the field of Information technology, Guilin University Of Electronic Technology to learn. However, there are many students could not easily to understand the content of programming language concept, they always have difficulties in studying it and are little interested in it and due to the fact thus failed in course. Therefore, the purpose of this study is to design and develop an interactive mobile game-based learning application in basic C language programming concept for beginner through application to introduces and helping students understanding the programming concept and syntax. The game-based application has digest programming class and quiz into the mobile game the students can play as the main character to explore the level and the story and at the same time learn about the fundamental principles behind it.

## 2. Background of the Study

The Improved Methods of Teaching Practice Based on C Language Programming. Programming in C is one of the basic courses of computer major in many universities. Because it is the pre-requisite course of the follow-up courses such as data structure, Analysis and Design of algorithms, System Software, object-oriented technology, it has been seen as one of the most important classes of computer major. That is why all the computer science teachers realize the significance of it in the process of teaching. The overview of teaching of C language program includes-Define Learning Goals, Increase Learning Interest and Improve Study Motivation Choose the Proper Textbook, Change Teaching Mode and Emphasize the Different Contents According to the Teaching Objects, Strengthen the Interaction, Adjust the Teaching Plan, Reallocation the

Teaching Hours of Theoretical Teaching and Practical Teaching, The Practical Teaching Mode, Arrange Task of Practice, Strengthen Checking the Practical Ability.

Computers are the leading technology of the 21<sup>st</sup> century. Programming, the development of software is thus a fundamental activity in which many people are engaged worldwide. Therefore programming courses are included as a part of the curriculum. In these courses, students are primarily introduced to language features. Traditionally, the students practice by applying the acquired knowledge to solve some logically straightforward problems giving less scope for the programming skills. This paper focuses on application of coding standards, coding techniques, test driven programming and pair programming based learning to master not only programming language features, but also an integrated approach to gain problem solving and programming skills. The subject is introduced as a first year course where the students are without any or with smaller amount of background or experience in computer programming. Taking this into consideration, activities like programming were designed. These activities enhanced the learning ability and problem solving skills. Index Terms-problem solving, programming skill, code optimization, test driven programming, debugging, coding standards.

## 3. Conceptual Framework

The concept of this study is based on the study of Vidya Handur, et al An Activity Based Learning: C Programming, (2015)

The **Research Framework** of the study is depicted in Figure 1 below.

The first two rectangular shape represents the two groups of respondents, namely the teacher and student.

The first box inside the big square shape are the awareness of students on the C language programming in terms of Learning ability and Problem solving skills, . The second box are the effectiveness of students on the C language programming in terms of Application of coding standards and Coding technique.

The significant difference on the assessment of respondents was presented by the broken lines. The arrow pointed in the two directions is the relationship between the awareness and effectiveness.

The ultimate objective of this study is an inputs for an enhanced implementation.

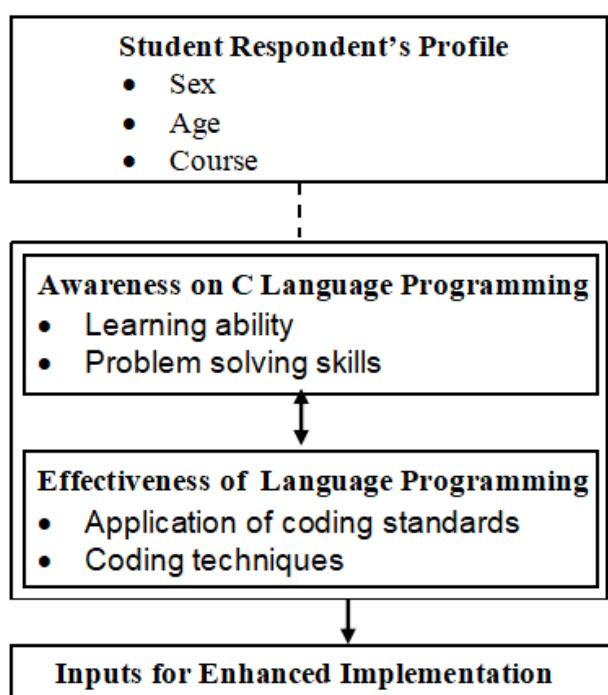


Figure 1: Research Paradigm

**Statement of the Problem**

This study assessed the awareness and effectiveness of students in language programming in a selected University in China with the end view of towards an instructional improvement. Specifically, it sought answers to the following:

- 1) What is the profile of the students respondents in terms of :
  - Sex,
  - Age, and
  - Course/degree?
- 2) What is the assessment of respondents on the awareness of students on the language programming in terms of the following?
  - Learning ability,
  - Problem solving skills,

- 3) Is there a significant difference in the assessment of respondents on the awareness of students on the language programming when grouped by profile?
- 4) What is the assessment of the student respondents on the effectiveness of students on the language programming in terms of the following:
  - Application of coding standards,
  - Coding techniques,
- 5) Is there significant difference in the assessment of student respondents on the effectiveness of students on the language programming when group according to profile?
- 6) Is there significant relationship in the assessment of student respondents between the awareness and effectiveness of students on the language programming?
- 7) Based on the results of the study what inputs for instructional improvement ca be proposed?

The hypotheses pursued in the study are the following: 1) There is no significant difference in the assessment of student respondents on the awareness of students on the language programming when group according to profile; ns 2) There is no significant difference in the assessment of student respondents on the effectiveness of students on the language programming when group according to profile; 3) There is no significant relationship in the assessment of respondents between the awareness and effectiveness of students on the C language programming.

The Significance of the Study will be realized from the results of the same as it would be of great significance and beneficial to the following stakeholders:

To the University, this study can be used by them as a sort of reference on how to deliver the effectiveness of C language programming.

To the Academic institution, particularly the Graduate School, the literature and studies, as well as the instruments and statistical tools used by this researcher will contribute to a wealth of reference to their students, particularly those who are enrolled in research writing.

To this Researcher, defending and submitting this study to the Graduate School will confer him with the Ph.D. Educational Leadership, thus qualifying him to hold a much higher position, carrying with it the prestige, honor, and privilege, appertaining thereto.

To the Future Researchers, in the same token as in the academic institution, the future researchers would benefit from this study, as they can use this as reference, should they conduct studies of similar imports.

The Scope and Delimitation of the Study confined in the awareness and effectiveness of students on C language programming enrolled in Guilin University of Electronic Technology in China with the end view of an inputs for an enhancement.

Furthermore, the study were limited to 180 students broken down as follows: automotive students 60; automotive students 60; and Communication student 60.

#### 4. Methodology

This study utilized the evaluation survey Research Design. Since the main objective of this study assessed by the respondents on the awareness of students on the C language programming in terms of Learning ability and Problem solving skills. And the effectiveness of students on the C language programming in terms of Application of coding standards and Coding techniques.

Likewise, this study is generally quantitative. Quantitative descriptive research design provides a description of an event or define a set of attitudes, opinions, or behaviours that are observed or measured at a given time and environment (Creswell, John W. and J. David, Creswell, 2018). It typically involved large samples. This design gathered information from the respondents in their assessment on the awareness of students on the C language programming in terms of Learning ability and Problem solving skills. And the effectiveness of students on the C language programming in terms of Application of coding standards and Coding techniques.

The Research Locale of the study confined in the Guilin University of Electronic Technology in China. The respondents assessed the awareness of students on the C language programming in terms of Learning ability and Problem solving skills. And the effectiveness of students on the C language programming in terms of Application of coding standards and Coding techniques.

The population and sampling procedure (Babbie, 2015; & Fowler, 2014 cited by Creswell, John W. and J. David, Creswell, 2018) provide for the essential aspects of the population and sample describe in a research plan. The population of this study is limited to 180 students broken down as follows: automotive students 60; automotive students 60; and Communication student 60. Babbie, (2015), stated that, the sampling design for a population, may either be a single stage or a multistage (called clustering). Accordingly, cluster sampling is ideal when it is impossible or impractical to compile a list of the elements composing the population (Babbie, 2015). On the other hand, a single-stage sampling procedure is one in which the researcher has access to names in the population and can sample the ,people (or other elements) directly.

As part of the rigorous data collection, the Research Instrument used by this researcher, is a self-made questionnaire designed with the help of his adviser. The designed and the developed survey questionnaire will be intended for the assessment of the respondents on the awareness of students on the C language programming in terms of Learning ability and Problem solving skills. And the effectiveness of students on the C language

programming in terms of Application of coding standards and Coding techniques.

Introductory letter to the respondents was included requesting them to answer all the items needed to completely gather the data required. In particular, the letter explains the objective of the study to the respondents. The main body of the survey questionnaire consists of two (2) parts. The first part was the assessment of respondents on the awareness of students on the C language programming in terms of Learning ability and Problem solving skills.

The second part is on the effectiveness of students on the C language programming in terms of Application of coding standards and Coding techniques.

For statistical analysis the following statistical tools were utilized:

The weighted mean scores was computed and measured the assessment of the groups of respondents. In order to obtain the weighted mean scores, the computed weighted mean scores in the assessment of the respondents on the awareness of students on the C language programming in terms of Learning ability and Problem solving skills. And on the effectiveness of students on the C language programming in terms of Application of coding standards and Coding techniques.

The Analysis of Variance (ANOVA) was used to test the hypothesis of no significant difference in the assessment of the respondents on awareness of students on the C language programming in terms of Learning ability and Problem solving skills. And on the effectiveness of students on the C language programming in terms of Application of coding standards and Coding techniques.

#### 5. Results and Analysis

Hereunder is the presentation of the results of the study, to wit:

##### 1) The profile of the students respondents are presented in Tables 1, 2, and 3.

Table 1 presents the summary of frequency and percentage distribution of the profile of the student-respondents in terms of their sex.

**Table 1:** Frequency Distribution of the Profile of the Student Respondents terms of their Sex

Sex	Frequency	Percentage
Male	146	81%
Female	34	19%
Total	180	100%

Table 1 shows that majority of the student-respondents are male which comprise 81% of the total population, with frequency of 146; while female are 34 or 19%. This implies that male are inclined to take up computer programming course than female.

Table 2 presents the summary of frequency and percentage distribution of the profile of the student-respondents in terms of their age.

**Table 2:** Frequency Distribution of the Profile of the Student Respondents terms of their Age

Age	Frequency	Percentage
18 - 20 years old	98	54%
21-22 years old	62	34%
Above 22 years old	20	11%
Total	180	100%

Results from Table 2 above revealed that majority of the student-respondents are aged 18-20 years old with frequency of 98 or 54%; while there are 62 or 34% of ages 21-22 years old; and the least are those above 22 years old, 20 or 11%. This implies that majority of the students are young and in their first and second year of tertiary education.

Table 3 presents the summary of frequency and percentage distribution of the profile of the student-respondents in terms of their course.

**Table 3:** Frequency Distribution of the Profile of the Student Respondents terms of their Course

Course	Frequency	Percentage
Automotive Program	60	33%
Electronic program	60	33%
Communication Program	60	33%
Total	180	100%

Table 3 shows that there are equal number of student-respondents in automotive program, electronic program and communication program, frequency of 60 each or 33%.

## 2) The assessment of student-respondents on the awareness of students on the language programming are presented in Tables 4 and 7.

Table 4 presents the summary of mean and verbal interpretation in the assessment of the student-respondents on the awareness of students on the language programming in terms of learning ability.

**Table 5:** Summary of Mean and Verbal Interpretation in the Assessment of Student-Respondent on the Awareness of Students on the Language Programming in terms of Learning Ability

Indicator Statements	Mean	VI
I am aware that it creates an ideal learning environment because freedom of learner is given utmost priority can improve learning ability.	3.34	SA/VMA
I am aware that the students are made available with the necessary data and material to focus on the subject matter and make them to think can improve learning ability	3.39	SA/VMA
I am aware that there can be various kinds of activities for implementing activity based learning that may depend upon ability of teacher, students, availability of time etc. can improve learning ability	3.39	SA/VMA
I am aware that it is also helpful to teachers because teacher can make their teaching interesting through different type of activities. can improve learning ability	3.38	SA/VMA
I am aware that educating the students through activities make all round development of students can improve learning ability	3.43	SA/VMA
I am aware that the students learn through a series of activities, with teacher being the facilitator of student learning. can improve learning ability	3.39	SA/VMA
Overall Mean	3.39	SA/VMA

### Legend:

4 - 3.51 – 4.00 Strongly Agree (SA)/Very Much Aware (VMA)

3 - 2.51 – 3.51 Agree (A)/ Aware (A)

2 - 1.50 – 2.50 Disagree(D)/ Less Aware (LA)

1 - 1.00 – 1.50 Strongly Disagree(SD)/ Not Aware (NA)

The student-respondents assessed the awareness of students on the language programming in terms of learning ability as *very much aware* as indicated in the overall mean score of 3.39. The indicator statement, *I am aware that educating the students through activities make all round development of students can improve learning ability* obtained the highest mean score of 3.43 with verbal interpretation of *strongly agree/very much aware*. This implies that the best way to educate students is through activities. It is worthy to note that most of the indicators were assessed as *strongly agree/very*

*much aware*. The student-respondents strongly agreed on the lowest mean score to statement: *I am aware that it creates an ideal learning environment because freedom of learner is given utmost priority can improve learning ability*.

Table 5 presents the summary of mean and verbal interpretation in the assessment of the student-respondents on the awareness of students on the language programming in terms of **problem solving skills**.

**Table 5:** Summary of Mean and Verbal Interpretation of Assessment of Student Respondent on the Awareness of Students on the Language Programming in terms of Problem Solving Skills

Indicator Statements	Mean	VI
I am aware that formulation of simple algorithms to arithmetic and logical problems can enhance problem solving skills	3.37	SA/VMA
I am aware that translating the algorithms (in C Language) can enhance problem solving skills	3.41	SA/VMA
I am aware that testing and executing the programs and correcting syntax and logical errors can enhance problem solving skills	3.38	SA/VMA
I am aware that Implementing conditional branching iteration and recursion can enhance problem solving skills	3.37	SA/VMA
I am aware that decompose a problem into functions and synthesizing a complete program using divide and conquer approach can enhance problem solving skills	3.33	A/A
I am aware that using arrays pointers and structures to formulate algorithms and programs can enhance problem solving skills	3.36	SA/VMA
I am aware that applying programming to solve matrix addition and multiplication problems and searching and sorting problems can enhance problem solving skills	3.32	A/A
I am aware that apply programming to solve simple numerical method problems, namely not finding of function, differentiation of function and simple integration can enhance problem solving skills	3.36	SA/VMA
Overall mean	3.36	SA/VMA

**Legend:**

4 - 3.51 – 4.00 Strongly Agree (SA)/Very Much Aware (VMA)

3 - 2.51 – 3.51 Agree (A)/ Aware (A)

2 - 1.50 – 2.50 Disagree(D)/ Less Aware (LA)

1 - 1.00 – 1.50 Strongly Disagree(SD)/ Not Aware (NA)

The student-respondents assessed the awareness of students on the language programming in terms of problem solving skills as *very much aware* as revealed in the overall mean rating of 3.36 interpreted as *strongly agree/very much aware*. Statement, *I am aware that translating the algorithms (in C Language) can enhance problem solving skills* was rated the highest mean score of 3.41 interpreted as strongly agree/very much aware. However, *I am aware that applying programming to solve matrix addition and multiplication problems and searching and sorting problems can enhance problem solving skills* was rated the lowest mean score of 3.32 with interpretation, *agree/aware*. Most of the indicators were rated as *very much aware*.

### 3) The significant difference in the assessment of the student-respondents on the awareness on language programming when groped by profile are presented in Tables 6.

Table 6 presents the summary of T-test on the significant difference in the assessment of the student-respondents on the awareness of students on language programming when grouped by their sex.

**Table 6:** Summary Result of T-test on Significant Difference in the Assessment of Student-Respondents on the Awareness of Students on the Programming Language when grouped by their Sex

Computed t	T Value	P Value	Decision
0.422	2.011	0.675	Accept Ho

The table above shows that summary of t-test to determine if there is significant difference on the assessment of student respondents on the awareness of students on the programming language when grouped by their sex. It can be seen from the table that the computed t is equal to 0.422 which is less that the t value (2.011). This made the researcher to accept the null hypothesis which implies that there is no significant difference in the assessment of the student respondents when grouped according to their sex.

### 4) The assessment of the student respondents on the effectiveness of students on the language programming are presented in Tables 7 and 8.

Table 7 presents the summary of mean and verbal interpretation in the assessment of the student-respondents on the effectiveness of students on the language programming in terms of **application of coding standards**.

**Table 7:** Summary of Mean and Verbal Interpretation of the Assessment of the Student Respondents on the Effectiveness of Students on the Language Programming in terms Application of Coding Standards

Indicators	Mean	VI
I can perform a common and standard coding style making it easier for various people to contribute in development of the same program.	3.26	SA/VE
I can perform uniform coding style at developing a program or system to improve readability and make it maintainable	3.27	SA/VE
I can inculcate better coding practices at introducing to certain coding standards throughout the term.	3.26	SA/VE
I can upgrade the application of coding standards which are limited to certain features like naming conventions, commenting styles and indentation styles.	3.28	SA/VE
I can assess the codes written as per the standards, with sufficient weightage provided as included in Term work Assessment Rubrics	3.33	SA/VE

I can describe a set of coding Standards and able to follow coding practices to write programs in C language	3.28	SA/VE
Overall Mean	3.28	SA/VE

**Legend:**

- 4 - 3.51 – 4.00 Strongly Agree (SA)/Very Effective(VE)
- 3 - 2.51 – 3.50 Agree (A)/ Effective (E)
- 2 - 1.51 – 2.50 Disagree(D)/ Less Effective (LE)
- 1 - 1.00 – 1.50 Strongly Disagree(SD)/ Not Effective (NE)

The student-respondents assessed the effectiveness of the students on the language programming in terms of application of coding standards as *very much effective* based on the overall mean score of 3.28. Statement, *I can assess the codes written as per the standards, with sufficient weightage provided as included in Term work Assessment Rubrics* was rated with the highest mean score of 3.33 interpreted as strongly agree/very effective. However, *I can perform a common and standard coding style making it easier for various people to contribute in development of the same program and I can inculcate better coding practices at introducing to certain coding standards throughout the term* were rated with the lowest mean score of 3.26 interpreted as

strongly agree/very effective. It is worthy to note that most of the indicators were rated strongly agree/very much effective.

The finding indicate that application of coding standards are much effective in the learning skills of language programming as evidenced by the assessments made by the student-respondents.

Table 8 presents the summary of mean and verbal interpretation in the assessment of the student-respondents on the effectiveness of the students on the language programming in terms of **coding techniques**.

**Table 8:** Summary of Mean and Verbal Interpretation of the Assessment of the Student Respondents on the Effectiveness of Students on the Language Programming in terms Coding Techniques

Indicators	Mean	VI
I know that coding techniques are used for data compression	3.26	SA/VE
I know that coding techniques may employ cryptography, error detection and correction, data transmission and data storage.	3.26	SA/VE
I know that coding techniques are reliable data transmission methods.	3.24	SA/VE
I know that coding technique typically involves the removal of redundancy and the correction or detection of errors in the transmitted data.	3.49	SA/VE
Overall Mean	3.31	SA/VE

**Legend:**

- 4 - 3.51 – 4.00 Strongly Agree (SA)/Very Effective(VE)
- 3 - 2.51 – 3.50 Agree (A)/ Effective (E)
- 2 - 1.51 – 2.50 Disagree(D)/ Less Effective (LE)
- 1 - 1.00 – 1.50 Strongly Disagree(SD)/ Not Effective (NE)

The student respondents assessed the effectiveness of the students on language programming in terms of coding techniques as very effective as revealed in the overall mean score of 3.31. Statement, *I know that coding technique typically involves the removal of redundancy and the correction or detection of errors in the transmitted data* was rated with the highest mean score of 3.49 which implies that students strongly agreed that coding techniques are very much effective to them in learning the language programming. Most of the indicators were rated very much effective as shown in the ratings given by the students. On the other hand, *I know that coding techniques are reliable data transmission methods*, obtained the lowest mean score of 3.24 interpreted as agree/aware.

respondents on the effectiveness of students on the language programming when grouped according to their sex.

**Table 9:** Summary of T-test Result on Significant Difference in the Assessment of Student Respondents on the Effectiveness of Students on the Language Programming when Group According to their Sex

Computed t	T Value	P Value	Decision
1.02	2.01	0.67	Accept Ho

The table above shows that summary of t-test to determine if there is significant difference on the assessment of student respondents on the effectiveness of students on the programming language when grouped by their sex. It can be seen from the table that the computed t is equal to 1.02 which is less that the t value (2.01). This made the researcher to accept the null hypothesis which implies that there is no significant difference in the assessment of the student respondents when grouped according to their sex.

**5. The significant difference in the assessment of student respondents on the effectiveness of students on the language programming when group according to profile are presented in Tables 9.**

Table 9 presents the summary of T-test results on the significant difference in the assessment of student

**The significant relationship in the assessment of student respondents between the awareness and effectiveness of**

students on the language programming is presented in Table 10.

**Table 10:** Summary of Correlation Analysis on Significant Relationship in the Assessment of Student Respondents between the Awareness and Effectiveness of Students on the Language Programming

Computed r	Verbal Interpretation	Computed T	T Value	Decision
0.92	Very High Correlation	34.86	1.96	Reject Ho

As presented in Table 19 the computed r of 0.92 which signifies a very high correlation on the variables of awareness and effectiveness of students on the language programming which revealed that there is significant relationship between the awareness and effectiveness of students on the language programming which called for the rejection of the hypothesis.

7. Inputs for instructional improvement was offered and presented as part of the recommendations.

Based on the statistical results of the gathered data as presented above, and the analysis of the same, the following are the **findings**, conclusions and recommendations, to wit:

- On the profile of the student-respondents
  - In terms of sex, majority of the student-respondents are male which comprise 81% of the total population, with frequency of 146; while female are 34 or 19%.
  - In terms of age, majority of the student-respondents are aged 18-20 years old with frequency of 98 or 54%; while there are 62 or 34% of ages 21-22 years old; and the least are those above 22 years old, 20 or 11%.
  - In terms of course, there are equal number of student-respondents in automotive program, electronic program and communication program, frequency of 60 each or 33%.
- On the assessment of the student-respondents on the awareness of students on the language programming:
  - in terms of learning ability, assessment was very much aware as indicated in the overall mean score of 3.39.
  - in terms of problem solving skills assessment was very much aware as revealed in the overall mean rating of 3.36 interpreted as strongly agree/very much aware
- On the significant difference in the assessment of the student-respondents on the awareness of students on the language programming when grouped by profile
  - when grouped according to their sex, there is no significant difference in their assessment which called for the acceptance of the hypothesis.
- On the assessment of the student-respondents on the effectiveness of students on the language programming:
  - in terms of application of coding standards assessment was very much effective based on the overall mean score of 3.28.

- in terms of coding techniques, assessment was very effective as revealed in the overall mean score of 3.31
- On the significant difference in the assessment of student respondents on the effectiveness of students on the language programming when group according to profile
    - when grouped according to their sex, there is no significant difference in their assessment which called for the acceptance of the hypothesis.
  - On the significant relationship in the assessment of student respondents between the awareness and effectiveness of students on the language programming**

There is a very high correlation on the variables of awareness and effectiveness of students on the language programming which revealed that there is significant relationship between the awareness and effectiveness of students on the language programming which called for the rejection of the hypothesis.

## 6. Conclusions

Majority of the student-respondents were male; aged 18-20 years old; taking up automotive program, electronic program and communication program.

The students are very much aware on the language programming in terms of the learning ability and problem solving skills.

There is no significance difference in the assessment of the student-respondents on the student awareness on language programming when they are grouped according to their profile.

Language programming relative to application of coding standards and coding techniques is very effective among students.

There is no significance difference in the assessment of the student-respondents on the effectiveness of student on the language programming when they are grouped according to their profile.

There is significant relationship between the awareness and effectiveness of students on the language programming which called for the rejection of the null hypothesis.

## 7. Recommendations

Create an ideal learning environment where students have the freedom to explore avenues for learning.

Use of application python rails written in Ruby to develop the programming skills of the students

Enhance the debugging skills of students to help them identify and fix issues on programming language

Employ SOLO (Structure of Observed Learning Outcomes) for the students to build their learning and thinking.

Recognize students' accomplishments and respond appropriately to their concerns.

Draw connections between the course material and its real-world applications.

Further studies on related topics with different variables are recommended to future researchers.

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