Programming Language Preference among Undergraduate Students in Nigeria

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Abstract:- This paper focuses on accessing the programming language preference among Computer Science and Computer Engineering undergraduate students in two Nigerian tertiary institutions. Its aim is to understand and bring to light, the reason behind the programming language choice and how it affects the design output and problem-solving ability of the students. Questionnaires were administered via Google docs and 410 Computer Science and Computer Engineering students of AkanuIbiam Federal Polytechnic, Unwana, and Nnamdi Azikiwe University, Awka, responded. The researcher asked questions based on curriculum, lecturers' influence, design goal, component reusability, platform consideration, and ease of debugging, code portability and more. The respondents revealed that they have personal favorites and that they would prefer a language that is stated in the curriculum and taught to them in addition to considering the complexity of the language elements, target platforms and suitability for the problem at hand and lecturers' influence. The researcher recommended that modern programming languages that can solve different real-life problems be incorporated into Computer Science and Computer Engineering curriculums in tertiary institutions in Nigeria. Lecturers were also urged to learn and master modern programming languages.

Keywords:- Programming, Students, Computer Science, Nigeria, Preference.

I. INTRODUCTION

Computer technology ranks as one of the greatest innovations in human history. Majority of the innovations in the world today were sourced, developed or implemented with computer and computer programming. Computer programming is the process of designing and building an executable computer program to accomplish a specific computing result or to perform a specific task. It involves tasks like - analysis, generating algorithms, profiling algorithms' accuracy and resource consumption, and the implementation of algorithms in a chosen programming language [1]. Programming involves an understanding of activities, modifying and debugging computer program. Indeed, the acquisition of programming skills is described as a vital instrument for developing problem solving skill [2].

Programming languages are generally classified into two groups according to how their commands are processed and mode of their translation. They include functional, imperative and interpreted and compiled programming language. The imperative language program involves the decomposition of a programming tasks into collections of variables, data structure and subroutines. Besides, imperative or language uses a series of commands grouped into blocks and comprising of conditional statements, which allows the program to return to the block of condition if condition is met. However, the functional programming language, also known as procedural languages, is the language which creates programs using functions, returning to a new output state and receiving as input the result of other functions. [4] described functional languages as the language that rely on mathematical functions to allow the reflection of a problem at a higher level of abstraction. E.g. LISP. Examples of the programming languages according to their mode of translation includes VB.Net, BASIC, JAVA, Perl, Python, Prolog, PHP, LISP, MATLAB (interpreted and intermediate languages) while the examples of compiled programming languages include Pascal, ADA, C-language, C++, COBOL, FORTRAN. Today, the programming language has undergone improvements and extensibility due to advancement in computer technology. Hence, there exist structured programming and particularly Object-Oriented Programming (OOP) which has become the Centre of interest of programming language among classroom teachers for about two decades

The major component of undergraduate Computer Science (CS) and Computer Engineering (CE) curriculum is programming. This is specified by the body which regulates university education in Nigeria, the one which regulates polytechnic education in the country and another which specifically regulates the practice of the computing profession in Nigeria. They are respectively the National Universities Commission (NUC), the National Board for Technical Education (NBTE) and the Computer Professionals Registration Council of Nigeria (CPN).

In fact, the last decade has witnessed a drastic change in the world of information technology, particularly it has brought about development in the computer technology which has affected both individual life and communal life. The importance of computer programming to undergraduate computer science and computer engineering students can never be overemphasized but despite its importance, many CS and CE students still run away from it. Some even go as

far as erasing every thought of learning it, tagging it 'difficult'.

In Nigeria, the focus of the study has been a dearth of resources with respect to knowing students' choice of programming language. This paper communicates the output of a study conducted on CS and CE in two tertiary institutions in Eastern Nigeria. It aims at determining the factors that impact their choice of programming languages and make recommendations to faculties based on these factors.

II. REVIEW OF RELATED WORK

Very few literatures exist in determining the preferences of programming languages among undergraduate students in Nigeria tertiary institutions. This is because the language of choice does not depend on pedagogical choices but also on industry as expressed by[5].Computer programming is important today because so much of our world and the things around us are automated. People need to be able to control the interaction between people and machines. Since computers and machines are able to do things so efficiently and accurately, we use computer programming to harness that computing power.

[6] opined that "Programming is considered as one of the most important aspect of computing as it enables logical thinking in computer scientists, bring their solutions to fruition and enables them build reliable software systems." [4] iterated that "increased problem-solving skills and computational thinking are some of the benefits of coding in a programming language." Technology. Programming is known for its complexity and difficulty, and thus many programming students havedifficulties with acquiring necessary programming competencies [7]

[6] conducted a study on programming language preferences among undergraduate student, especially female Computer Science undergraduate students in Nigerian tertiary institutions. The study was with the aim 0f determining the factors that influence the choice of programming language among these set of undergraduates as well as the effects on the choice of programming language on efficiency and problem-solving abilities of student. A mixed method was adopted for this study (quantitative and qualitative). The quantitative employed a descriptive survey design method while the qualitative made use of in-depth interview. The study was carried out in four tertiary institution in the North-Central zone of Nigeria. Similarly, 35 questionnaires were administered to 35 participants based on certain criteria like personal interest, technical properties (syntax and semantics) and were returned immediately. In the same context, 15 onsite interviews were conducted and the interviewees' response to the touch points was recorded. The findings revealed that the students were indifferent to the technical features. However, they showed preference for language that provides support for modularity and those that are easy to learn and understand.

[8] in his study examined how gender could affect computer programming preference among student. In the study, the researcher aimed at finding out which gender engage more in programming language course. In an attempt to achieve the objectives, the researcher limited the scope of programming language to mark-up language and scripting language (HTML, VBScript, JavaScript, PERL) with some assumptions stated. The study was conducted in Moraine valley Community College and data was obtained from the computer programming course tracks, especially in the introductory course. The data gathered was analysed using descriptive statistics to determine the model of registration among the female folks with respect to their inclination to the computer programming language of their choice. Findings revealed that gender does not have a significant effect on the preference of student in their choice of computer programming language at the college.

[9] examined computer programming attitude and self-efficacy of the undergraduate and associate degree students' in Turkey according to some individual variables. The study was conducted using quantitative research method. Questionnaires were administered to 306 participating students but 305 were returned. Two major instruments were used to gather information in this study namely Computer Programming Self-Efficacy Scale, Computer Programming Attitude Scale (CIAS)and Holistic and Analytic Thinking in Problem-solving Scale developed by [10],[11] and [12]. The data obtained was analysed using multivariable regression analysis and MANOVA. Results implied that the participants with different thinking styles showed significant differences with regards to programming attitude and programming self-efficacy. Programming attitude and thinking style were significant predictors of programming self-efficacy. IN addition, there is no meaningful difference between genders in terms of the common effect and the partial effect of programming attitude and programming self-efficacy. Nevertheless, changes were observed between participants from different departments and with different weekly study time.

III. MATERIALS AND METHODS

A. Research Design
The study aimed at determining the preference of undergraduate students on their choice of programming language using the criteria and the set of assumptions made. method adopted in this study is the descriptive survey research design to obtain the appropriate information and data, which seeks to describe events, conditions and occurrences as they are without manipulations of what caused the events that is being described. The rationale behind the adoption of descriptive survey research design is to examine a phenomenon in the state of Anambra with respect to science teacher's competence and attitude towards computer integration in teaching science subjects in secondary schools.

B. Research Sample Space and Data Gathering

This research was conducted among the undergraduate computer science and engineering students in two tertiary institutions in South-Eastern state of Nigeria. There were no special criteriaused in the selection of these two institutions other than the fact of their proximity to the researcher. In addition, due to the few numbers of undergraduate students in the sciences, the only way to get a substantial sample space is by expanding the study sites beyond the researcher's present institution. The researcher also felt it is necessary to obtain diverse opinions across more than one institution. This study adopted the Computer Programming Attitude Scale instrument developed by [11] to collect data.The data used for this study were collected through both primary and secondary sources.Primary data used were obtained by using online survey method of sending questionnaires to undergraduate students across the twotertiary institutions. A total of 410 questionnaires wasadministered anddistributed to respondents through online means and immediately collected back upon completion leading to a response rate of 100%. This is with the view to determine the choice of the students toward computer programming. The five-point Likert-type scale consists of two factors and x items. For each item, the participant picks one of the following preferences: Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), Strongly Disagree (1).The results of the online survey questionnaire were received and analyzed via Google form using percentages.

	Characteristics	Frequency	percentage frequency (%)
School			
UNIZIK		279	72
AIFPU		131	32
Total	410	100	
Gender			
Male	324	79	
Female	86	21	
Total	410	100	
Course of Study			
CS	295	72	
CE	115	28	
Total	410	100	

Table 1: Participant's demographic characteristics

KEY: CS=Computer Science, CE=Computer Engineering

Detailed information of the participants according to school and gender of undergraduate as depicted in Table1. 279 students were from UNIZIK and 131 from AIFPU from the various CS and CE departments respectively. Of the total 410 participants, 79% were males and 21% were females in the study.

In addition to the specific questions, testing for factors responsible for programming language preferences, personal information like Institution, course of study, sex among others were asked in the survey. To determine what factors that influenced the choice of programming languages among undergraduate CS and CE students, the researcher developed a set of evaluation criteria. These were based on the informational criteria of programming languages knowledge and the semantic dimensions of the codes and coding process, the syntax and semantics of the language elements as well as other technical considerations.

These group of questions were drawn up to test the students' favourite language based on individuals'interest consequent of what is known about language(s). The knowledge is not restricted to languages taught as part of the curriculum but also included those programming languages the students choose to learn on their own or are generally familiar with as a result of their association with the community of user. Questions were drawn up to check the number of students' preference for a particular/specific language centered on the following informational yardstick (see Table 1).

The questions drawn up under the semantic dimensions checked the students' preferences based on the technical properties of the language environments and those of the codes and other by-products resulting from the language.

IV. DISCUSSION OF RESULTS

A. Percentage distribution of respondents according to institution of study

68% of respondents are from Nnamdi Azikiwe University, Awka (UNIZIK) while 32% are from AkanuIbiam Federal Polytechnic, Unwana (AIFPU).
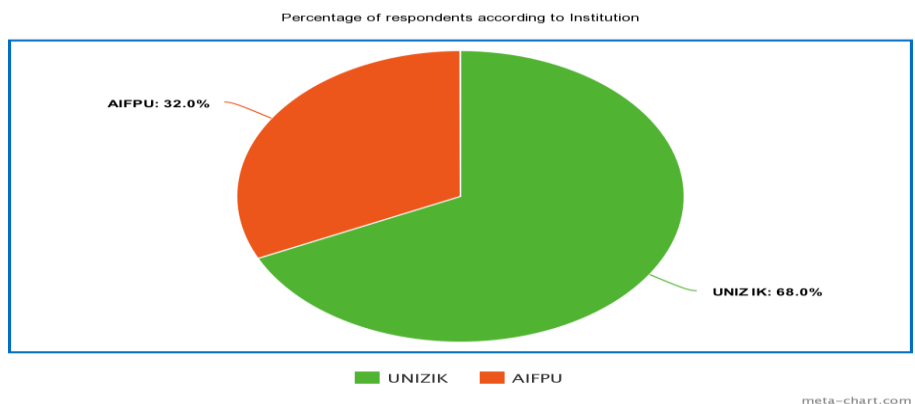

Fig. 1: Percentage of respondents according to Institution

B. Percentage distribution of respondents according to course of study

72% of respondents are studying Computer Science while 28% are studying Computer Engineering.
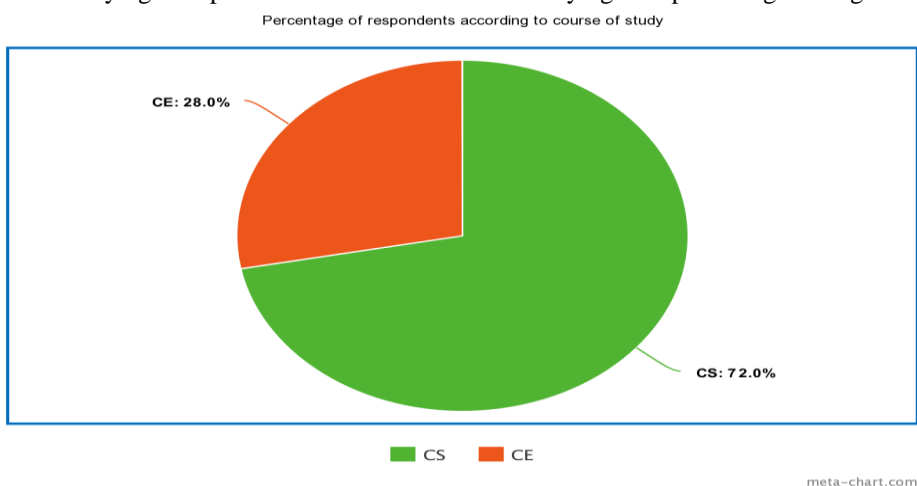

Fig. 2: Percentage of respondents according to course of study

C. Percentage distribution of respondents according to sex

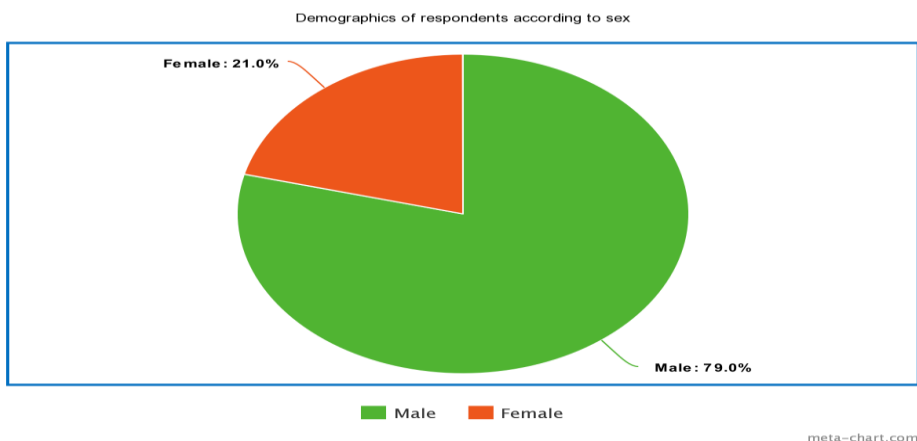79% of respondents are male, while 21% are female.

Fig. 3: Pie chart showing the demographics of respondents according to sex

D. Level of study of respondents

For the level of study of respondent's participants, 5% of respondents are National Diploma (ND) 1/Year 1 students, 7% are ND 2/Year 2 students. 37% are Higher National Diploma (HND) 1/Year 3 students, 42% are HND 2/Year 4 students. While 9% are Year 5 (CE) students.
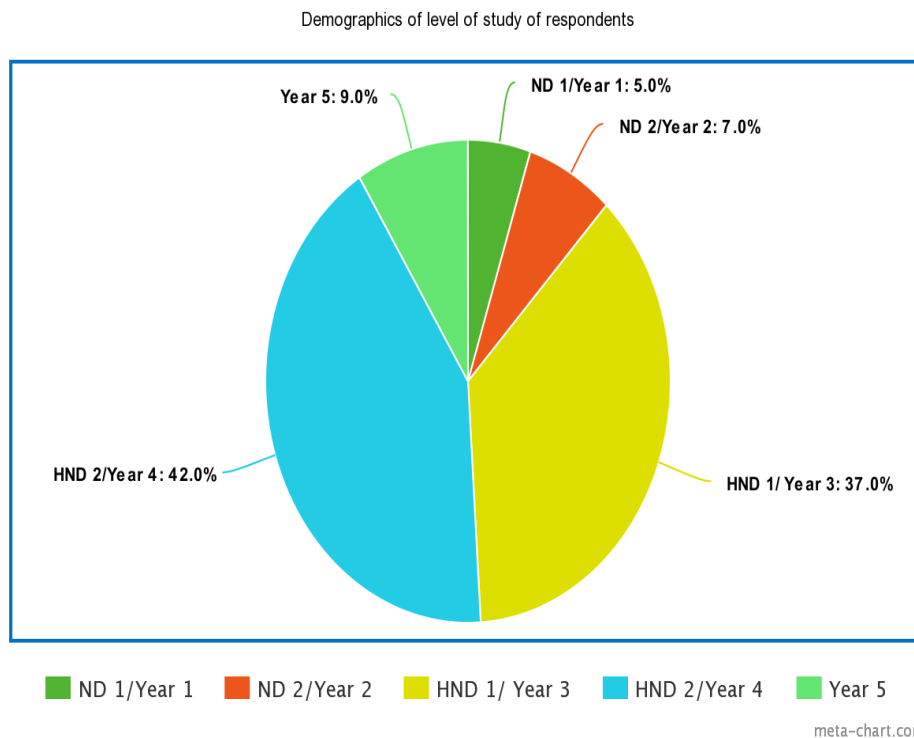

Fig. 4: Demographics of level of study of respondents

E. Level of perceived interest in learning programming

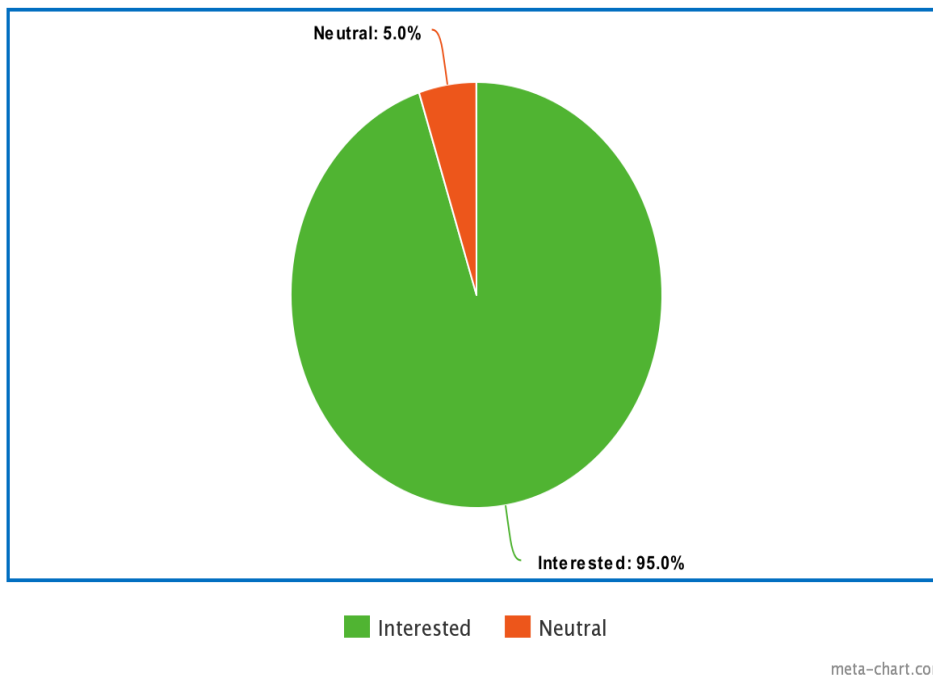95% of respondents have interest in programming, while 5% are neutral about it.

Fig. 5: Demographics of respondent's interest in learning programming

F. Favourite Programming Language

As regards the preference of language, 27% of the respondents revealed that Python is the favorite language they use. Another 27% selected Java. 17% chose PHP, 17% chose JavaScript while 7% chose C++. However, the remaining 5% chose Visual Basic.Net, C-language, R-programming, Cascade Style Sheet (CSS) and others.
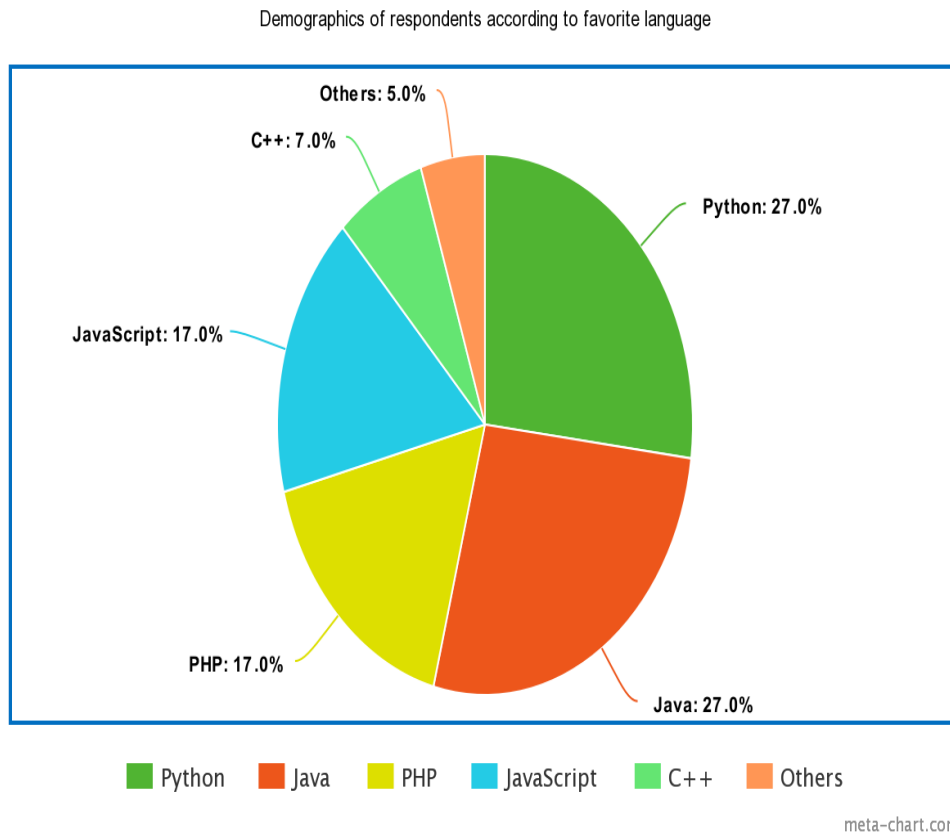

Fig. 6: Demographics of respondents according to favorite language.

G. Personal interest and semantic dimension tests

Questions based on PERSONAL INTEREST	Choice (n=410)				
	SA(%)	A(%)	N(%)	D(%)	SD(%)
Programming Skills are enforced in my department	31	40	13	9	7
Lecturers Influence my likeness to a Programming Language	35	30	22	13	-
I select programming language based on how suitable it is for my design goal	38	44	18	-	-
My choice of language is influenced based on how easy it is	64	22	14	-	-

Table 2: Table showing the items constructed to answer question based on personal interest.

Questions based on SEMANTIC DIMENSION	SA(%)	A(%)	N(%)	D(%)	SD(%)
My choice of language is influenced based on availability of user support	16	28	40	9	7
My choice of Language is based on its Career opportunity and Flexibility	23	49	17	2	9
Component reusability affects my choice of language	46	31	9	10	4
Code Portability affects my choice of Language	11	35	32	20	2
Ease of Debugging affects my choice of Language	45	41	13	1	-
Platform Consideration affects my choice of language	40	35	6	16	3
I choose Language based on how it enhances my problem-solving skills	16	61	14	5	4

Table 3: Table showing the items constructed to answer question based on semantic

Table 2 shows that suitability of a student's design goal is one of the major factors that influence their programming language choice. Another notable factor is based on the career opportunities available and flexibility of the language. The curriculum is also another factor that affects students' language preference as 71% of respondents revealed that programming language is enforced in their department via courses offered. 77% of the students choose a language based on how it enhances their problem-solving skills. 64% of the students strongly prefer an easy to learn language, as this saves time to development of their applications. 86% of the students will choose a language based on how easy it is to debug. 65% of the students revealed that their lecturers influence their likeness towards using a programming language. A mere 16% strongly agreed that their choice of language is influenced based on availability of user support.

Similarly, the analysis of the research result also shows that 77% of them would show preference for a language that allows them re-use components (methods, modules, functions, subroutines, blocks, etc). In addition, 75% of the students would strongly consider the platform environment where the resultant application will run before choosing a programming language for development and considerations will be given to the target operating system(s) as well as the database systems and other middleware.

V. CONCLUSION

This paper focuses on accessing the Programming Language preference among Computer Science and Computer Engineering students of AIFPU and UNIZIK. A survey using questionnaire was done and the responses were reported herein. Findings reveal that students prefer programming languages that enhances their problem-solving skills, reuse of previously designed component and suitability for their design goal. It also reveals that to a larger extent, lecturers influence their likeness to a programming language. Career opportunity for certain programming languages also affects students' preference. However, since students revealed that their choice of language is greatly influenced by career opportunity, curriculum and their lecturers, the researcher recommends that modern programming languages that are in high demand in the labor market and can solve different real-life problems be incorporated into Computer Science and Computer Engineering curriculums in our tertiary institutions. The researcher encourages lecturers to learn and master modern programming languages "on-the-go", as well as encourage students to pick interest in these languages irrespective of how difficult it seems, as they (lecturers) greatly influence the students' choices.

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