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Full Length Research Paper

Perceived effects of attitude, methodology and resources towards computer programming knowledge acquisition

Ismail Olaniyi Muraina* and Imran Ademola Adeleke

Department of Computer Science, Adeniran Ogunsanya College of Education, School of Science, Lagos State, Nigeria.
*Corresponding Author E-mail: niyi2all@yahoo.com

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ABSTRACT: Student attitudes toward computer programming continue to be a source of contention, whether positive or negative. This sparked a series of debates among researchers; some agreed that students' attitudes toward programming are negative, while others believed they are positive. The paper examines the major obstacles that contribute to students' poor performance in computer programming. The target population sample was created using a simple random technique by computer science students at the degree level. Students' attitudes, teachers' methodologies, and managements' resource provision were all used to collect data. The findings of this study indicated that the provisions made for the course and the methods used by the teacher to teach the languages influenced students' attitudes toward programming. It was recommended that teachers employ multimodal approaches (the use of multiple strategies) when instructing students in computer programming languages, while also providing adequate resources for effective knowledge acquisition.

Keywords: Students' attitudes, computer programming, methodology, resources

INTRODUCTION

Students' poor performance in computer programming languages at various levels of education in Nigeria has necessitated immediate attention. The pleasant interaction with the students demonstrated that their attitude toward programming is always fantastic. At the same time, another unexplored area to investigate is teachers' programming methodology, because teaching and learning programming languages in most cases rely on learning styles on one hand and the provision of necessary facilities and materials on the other. According to research, improving students' attitudes toward programming has long been a hot topic (Du et al., 2016). For decades, students' attitudes toward programming have been studied (Koohang, 1989), and it has been shown to cause anxiety (Raub, 1981). Furthermore, research has shown that learning and teaching computer programming is difficult, and student retention is difficult. Teaching methods used by teachers in other courses should not be assumed to be applicable to teaching programming languages. Other courses may require a single method, whereas teaching computer programming requires a variety of methods and is always a hands-on experience. In order to effectively learn computer programming, the student to computer system ratio should be one to one. Even if separate jobs are assigned to the students, they can later collaborate together based on their individual capabilities.

Adeniran Ogunsanya College of Education's computer programming courses are part of many higher education institutions' curricular and core program/course for computer science students. Scholars Winslow (1996), Wiedenbeck, LaBelle, and Kain (2004), and Sutinen and Vesisenaho (2006) discovered that learning programming languages presents a significant challenge for many students and is difficult to grasp. Students' attitudes toward computer programming remain ambiguous: are they positive or negative? Many studies have found that students have a negative attitude toward programming

(Baser, 2013; Korkmaz and Altun, 2013), whereas Ozyurt and Ozyurt (2015) claim that students have a positive attitude. Because programming in computer science courses requires high-level thinking skills such as problem-solving, logical thinking, and mathematical thinking, students' attitudes toward programming may always be negative (Baser, 2013; Ozyurt and Ozyurt, 2015; Karaci, 2016). As a result, previous research (Apiola and Tedre, 2012) identified a number of factors that contribute to these difficulties, including poor learning styles, pedagogy, a lack of facilities, and a variety of other factors. Furthermore, previous research (Apiola and Tedre, 2012) indicated that students' learning outcomes and difficulty in learning to program are attributed to factors such as poor study method; low self-efficacy, various types of motivations to learn the course, lack of early exposure or previous experiences with computers, learners' abilities and attitudes, nature of the course itself, and limited access to technology.

Every child thinks and comprehends in a different and unique way. According to Oroma et al. (2012), for some students, learning is when they discuss with other students, while for others, learning is when they read and search for information. As a result, the teachers' teaching method is in the best position to reshape student thinking toward computer programming. In most cases, the teachers' teaching method will enable students to develop a positive attitude toward programming. Any insufficient learning styles or methods used by teachers will eventually result in a negative attitude toward programming. According to research, computer programming is not a task that novices can master (Du et al., 2016). This is one of the reasons why teachers should make a concerted effort to employ a variety of methods to facilitate programming education.

Examining the use of various teaching methods Mohorovicic and Strcic, (2011) conducted a study on computer programming teaching strategies and discovered that the following strategies are effective: problem-based learning, puzzle-based learning, pair programming, prerecorded lectures, and game-themed programming. The main point about these strategies is that they all aim to increase students' positive attitudes toward learning programming languages. As a result, it is the teacher's responsibility to choose an appropriate teaching method, or a combination of methods, to increase students' positive attitudes toward computer programming.

Several tools have been developed by various programming teachers to support learners (Anabela and Mendes, 2007; Zyurt and zyurt, 2015). The school administration/department must provide what is required to make the aforementioned strategies workable. The computer science department should plan for necessary computing facilities such as workstations and servers, a standard computer laboratory, and so on.

According to Benford, Burke, Foxley, Gutteridge, and Zin (1993), the necessary facilities are divided into three categories: students, teachers, and course developers. Because of the cost implications, facility provision should be made available and sufficient by management, as should the selection of good facilities and a proper maintenance culture.

The following hypotheses will guide the research:

1. Students' attitudes have a significant positive direct influence on effective computer programming teaching and learning.

2. The attitude of students has a significant positive direct influence on the methodology of teachers.

3. The methodology of teachers has a significant positive direct influence on effective computer programming teaching and learning.

4. The methodology of teachers has a significant positive direct influence on the provision of management resources.

5. The provision of management resources has a significant positive direct influence on the effective teaching and learning of computer programming.

6. The provision of management resources has a significant positive direct influence on student attitude.

MATERIALS AND METHODS

This study assesses students' attitude, teachers' methodology and management' resources provision towards effective computer programming at Achievers University, Owo Ondo State, Nigeria. Achievers University offers computer science programme at both 100 and 200 levels undergraduates. In order to achieve the aims and goals of this study, fifty students were selected from both levels.

Questionnaire formed the major instrument used to collect data; the questionnaire was constructed to seek opinion of respondents on attitude, methodology and resources provision towards teaching and learning computer programming. In realizing the validity and reliability of the instrument, a copy of the instrument was given to some targeted students to see whether the content therein is well understood to ensure the validity of the questionnaire. It was then also peer reviewed (Author's Colleagues) to see that the content therein is within the scope of the study.

The questionnaire instrument was tested using Cronbach's Alpha with the r =.73. The data generated were analyzed using Structural Equation Modelling (SEM)

using SmartPLS 3.0 (Ringle et al., 2015).

RESULTS

Descriptive statistics

Table 1 displays the descriptive statistics for each item. All mean scores are greater than 1.00, with a range of 2.760 – 3,540. The standard deviations range between 0.596 and 1.000. The Kurtosis and Skewness indices show acceptable ranges, and according to (Kline, 2005) recommendations, the Kurtosis and Skewness indices should not exceed to ensure data normality. As a result, the data in this study is considered normal for the SEM (Table 1). Figure 1 depicts a study's hypothetical model. As previously stated, effective computer programming teaching and learning is dependent on students' attitudes toward programming languages, teachers' methodology used in teaching programming, and management's provision of resources required for successful computer programming teaching and learning. Furthermore, the provision of management resources was based on the methodology of teachers and students' attitudes toward computer programming. Finally, teachers' methods were influenced by students' attitudes.

Figure 2 discloses items attached to each of the latent variables. As we can clearly see, students' attitude variable has three items (LOTPOS, SP and NOCP), teachers' methodology has four items (UOBLA, UOCC, UOPA, and UOTA), management resources provision has three items (EROSTCS, POSAML and POTIS) and Effective teaching and learning of computer programming that has three items (GSSTIPK, RBEARTTC and SSHPATCP) respectively.

In the outer model, the quality of each measured variable's measure was checked using the Indicator Reliability (Table 2) to ensure that the measurement variables (MVs) loaded meaningfully on their associated constructs. The loading MVs are all, on the whole, quite large and positive. The reliability of each indicator was higher than 0.526, indicating that the construct accounted for at least half of the variance in the observed value. Cronbach's alpha values for all four reflective latent variables are between 0.475 and 1.000 in (Table 3), demonstrating moderate levels of internal consistency reliability. The validity of the widely used measurement model is checked using an AVE (Average Variance Extracted). The AVEs of the latent variables should be greater than the square of the correlations among the latent variables to ensure discriminant validity of the constructs. The AVEs squared root exceeds the shared variance with other constructs for each construct, confirming that the constructs are independent of one another. Because of this, the model's discriminant validity is strong (Table 2). Table 3 shows that the variable Effective Teach. & Learn.

Computer Programming is 0.809 (Table 2), so its square root is 0.9386. This number is higher than the correlation values in the Effective Teach. & Learn. Computer Programming column (0.367, 0.432 and 0.095 which gives [0.894] adding together). A similar observation is made for the latent variable Mgt. Resources Provision, which was found to be 0.857 with a square root of 0.9257. It is also greater than (0.367 on the row) and (0.385 and 0.264 on the column); finally, Teacher's Methodology value (0.792) is greater (after square root = 0.889) than the row of Teacher's Methodology (0.095, 0.264, and 0.335 which gives [0.694]). The result indicates that discriminant validity is well established. Figure 3 illustrates the final estimated structural model for the study. In order to have well screened items, some of the items that loaded (low loaded items) were removed from the model to have clean results. Out of three items loaded to students' attitude, two items were dropped. Likewise, on teacher methodology variable two items were equally dropped. Out of three items in effective teaching and learning of computer programming variable only one item was dropped while nothing was dropped from management resources provision variable.

Test of Hypotheses

The estimated model is presented in (Figure 3) where the significant path is highlighted and the ability of the model to explain variation in the endogenous variable is indicated for each construct. The model explains 24% of the variation in effective teaching and learning of programming languages. The estimated coefficients are statistically significant against Students Attitude -> Effective Teach. & Learn. Computer Programming at a significance level of 0.05 when t-test greater than 1.96. Table 4 shows relationships between constructs, in which Students Attitude -> Teacher's Methodology is statistically significant level at 0.05, other are not statistically significant.

DISCUSSION

According to the findings, student attitude has a significant positive effect on effective programming teaching and learning. Furthermore, at the 0.05 level, student attitude has a significant positive effect on teachers' methodology, whereas management resources provision has no significant positive effect on effective teaching and learning of programming in computer science; student attitude does not have a significant positive effect on management resources provision; teachers' methodology does not have a significant positive effect on effective teaching and learning of programming in computer science. Similarly, teachers' methodologies have no significant positive effect on

Table 1: Descriptive statistics of the items in the measure.

Construct	Items	Mean	Median	Standard Deviation	Kurtosis	Skewness
Students Attitude	LOTPOS	2.760	3.000	0.763	0.465	-0.666
	SP	2.760	3.000	0.838	-0.316	-0.351
	NOCP	3.060	3.000	0.810	0.577	-0.811
Teachers' Methodology	UOPA	3.280	3.000	0.776	1.143	-1.077
	UOTA	3.120	3.000	0.791	0.295	-0.723
	UOBLA	3.200	3.000	0.748	1.227	-0.945
	UOCC	2.960	3.000	0.979	-0.700	-0.577
Management Resources Provision	POSAML	3.200	4.000	1.000	-0.086	-1.039
	EROSTCS	3.260	3.000	0.844	0.172	-0.949
	POTIS	3.380	4.000	0.869	1.283	-1.407
Effective Learning and Teaching Computer programming	SSHPATCP	3.500	4.000	0.831	2.862	-1.835
	GSSTIPK	3.540	4.000	0.754	1.752	-1.584
	RBEARTTC	3.620	4.000	0.596	0.888	-1.360

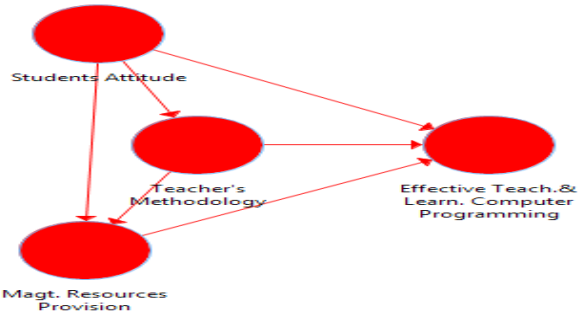

Figure 1: Hypothetical model.

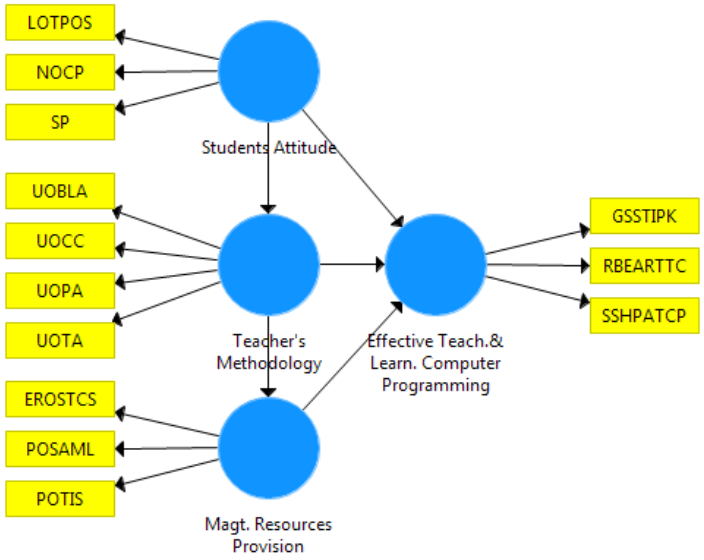

Figure 2: Semi final hypothetical model.

Table 2: Summary of results for reflective outer model.

Latent variables	Items	Loadings	Indicator Reliability (loadings^2)	Composite Reliability	AVE
Student's Attitude	NOCP	1.000	1.000	1.000	1.000
Teachers' Methodology	UOBLA	0.810	0.656	0.792	0.656
	UOCC	0.809	0.654		
Management Resources Provision	EROSTCS	0.815	0.664	0.857	0.668
	POSAML	0.725	0.526		
	POTIS	0.902	0.814		
Effective teaching and learning computer programming	GSSTIPK	0.881	0.776	0.809	0.680
	RBEARTTC				

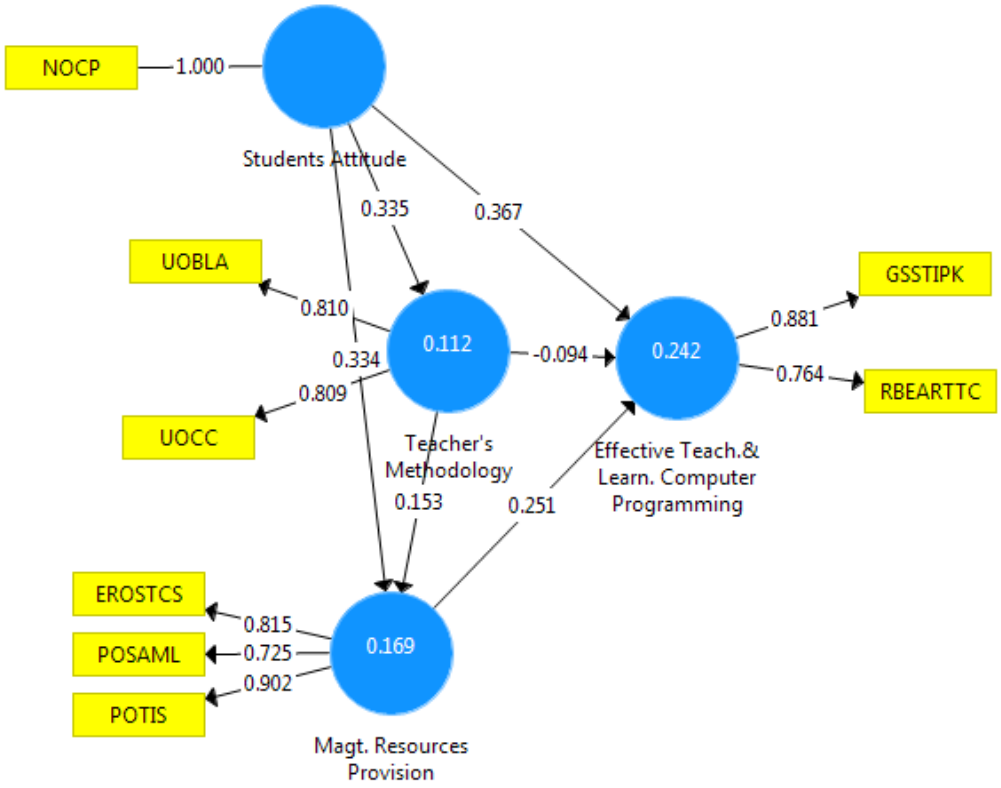

Figure 3: Final estimated structural model for effective teaching and learning computer programming.

management resource provision. This advocated that student attitude has a significant direct positive effect on effective teaching and learning (Hypothesis I); student attitude has a significant positive direct effect on teachers' methodology (Hypothesis II); management resources provision has no positive significant effect on effective teaching and learning of programming (Hypothesis V); management resources provision has no positive significant effect on effective teaching and learning of programming (Hypothesis VI); management resources provision has no positive significant effect on effective teaching and learning of programming (Hypo (Hypothesis III). Similarly, teachers' methodologies have no significant positive effect on management resource provision (Hypothesis IV). In Figure 3, the direct effect of student attitude, teachers' methodology, and management resources provision is 0.242, indicating that the total effect of the three variables accounts for only 24 percent; student attitude contributes 0.367, teachers' methodology contributes -0.094, and management resources provision

Table 3: Assessment of the validity of the latent variables.

	Effective Teach. & Learn. Computer Programming	Mgt. Resources Provision	Students Attitude	Teacher's Methodology	Cronbach's alpha	R^2
Effective Teach. & Learn. Computer Programming	(0.824)				0.537	0.054
Mgt. Resources Provision	0.367	(0.817)			0.772	0.119
Students Attitude	0.432	0.385	Single item construct		1.000	
Teacher's Methodology	0.095	0.264	0.335	(0.810)	0.475	0.281

Table 4: T-Statistics for path estimates.

Hypotheses	Path Coefficients	T Statistics (|O/STDEV|)	P Values	Results
Mgt. Resources Provision -> Effective Teach. & Learn. Computer Programming	0.251	1.186	0.236	Reject
Students Attitude -> Effective Teach.& Learn. Computer Programming	0.364	2.248**	0.025	Accept
Students Attitude -> Mgt. Resources Provision	0.334	1.406	0.160	Reject
Students Attitude -> Teacher's Methodology	0.335	1.972**	0.049	Accept
Teacher's Methodology -> Effective Teach.& Learn. Computer Programming	-0.094	0.562	0.575	Reject
Teacher's Methodology -> Mgt. Resources Provision	0.153	0.657	0.511	Reject

Note: ** significant at 5% level (t > 1.96)

contributes 0.251. This finding suggests that students' attitudes have a significant impact on the teaching and learning of computer programming, as well as the type of method that is best suited for the effective teaching and learning of programming languages in computer science. According to Oroma et al. (2012), teachers' teaching methods are best suited to reshape student thinking toward computer programming. Similarly, students' attitudes toward programming learning should be taken seriously because they have a significant impact on learning programming effectiveness. According to Raub (1981), students' attitudes toward programming have been shown to cause
anxiety.

Conclusion

The paper investigates the effects of students' attitudes, Teachers' methodology and management resources for effective computer programming teaching and learning. The target population consisted of students from Adeniran Ogunsanya College of Education (both NCE and Degree students). It was discovered that students' attitudes, as well as teachers' methodologies, have an impact on the effective teaching and learning of computer programming. It was also discovered that teachers' methodologies have no effect on the effective teaching and learning of computer programming and the provision of

management resources. At the same time, management resource provision has nothing to do with student attitude or effective computer programming teaching and learning.

Recommendation

With respect to the findings, below recommendations were made:

(a) Relevant methods should be applied to teach computer programming.
(b) Use of multimodal approaches of teaching a concept of programming should be encouraged.
(c) Student's attitude should be observed and encouraged towards computer programming.
(d) School management should make it a duty to provide all needed materials for proper teaching and learning of computer programming.
(e) Students should always be motivated towards learning computer programming via issuing certificates to them free of charge.

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