

## DESIGN AND ANALYSIS OF A COMMUNICATION NETWORK USING NETWORK SIMULATOR

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### Abstract

*In the network research area, establishing of network in a real time scenario is very difficult. A single test bed takes a large amount of time and cost. So implementation of a whole network in real world is not easily possible and very costly to. The simulator helps the network developer to check whether the network is able to work in the real time. Thus both the time and cost of testing the functionality of network have been reduced and implementations are made easy. In this paper, we introduce the main features of different simulator and consider their advantages and disadvantages. We hope this survey prove to be a good reference source for those people who feel difficult to select the appropriate network simulators for their research. In the comprehensive computer network's research area, it is very expensive to design a whole network, without the simulation process because, if we design with actual equipment's, then it may be very expensive and take more time. So by the help of network simulation tools, we can create cost effective and time saving scenario. Different types of wire and wireless networks, can be deployed by the help of, simulation tools. Computer network simulators are also useful, in allowing the network designers, to test new networking protocols or, to change the existing protocols, or create its own protocols in a controlled and reproducible approach. In this paper, we have presented the comprehensive survey, on current network simulators like Net Sim, OPNET, NS-2, NS-3, OMNeT++, REAL, J-Sim and QualNet. This paper is a comprehensive reference source, for those who feel the difficulty, to select the appropriate network simulators, for their research requirements, based on advantage and disadvantage of various network simulators. We will be introducing an overview of ns2, its installation in Kubuntu 14.04 and its scripting*

**Keywords:** Network Simulator, NS2 , NS3 , OPNET, NetSim, OMNeT++, REAL, J-Sim and

*QualNet. Computer Network, Simulator, Ns-2, TCL & OTCL, Kubuntu 14.04.*

### INTRODUCTION

Simulation is one of the important technologies in modern time. The simulation in computer can model hypothetical and real-life objects on a computer so that it can be studied. The network is also simulated on the computer. A network simulator is a technique of implementing the network on the computer. Through this the behavior of the network is calculated either by network entities interconnection using mathematical formulas, or by capturing and playing back observations from a production network. Network simulator allows the researchers to test the scenarios that are difficult or expensive to simulate in real world. It particularly useful to test new networking protocols or to changes the existing protocols in a controlled and reproducible environment. One can design different network topologies using various types of nodes (hosts, hubs, bridges, routers and mobile units etc.) The network simulators are of different types which can be compared on the basis of: range (from the very simple to the very complex), specifying the nodes and the links between those nodes and the traffic between the nodes, specify everything about the protocols used to handle traffic in a network, graphical applications (allow users to easily visualize the workings of their simulated environment.), text-based

applications (permit more advanced forms of customization) and programming-oriented tools (providing a programming framework that customizes to create an application that simulates the networking environment to be tested.) There are different network simulators with different features. Some of the network simulator are OPNET, NS2, NS3, NetSim, OMNeT++, REAL, J-Sim and QualNet. In this paper we are working on some of the simulator.

## **SIMULATION TOOLS**

### **Network Simulator 3 (NS3)**

A type of open source discrete-event network simulator used for targeted primarily for research and educational purposes and Internet systems are named as Network Simulator version3. NS3 is a free open source network simulator licensed under the GNU GPLv2 license that is not an extended version of NS2. NS3 is available for all development and research work in now a day; it can rely on to design a new models, debug and maintain an existing one and also share the resultant output. NS3 is built as a library which is linked to a main C++ program dynamically or statically that also defines the type of simulation topology and then it starts the simulators. OMNET++ provides GUI support and NS3 offers attribute system support and OPNET offers grid computing support. NS3 is still under various developments. It has certain chief challenges. One of the most prominent and prevalent challenges is that NS3 requires contribution from the research community. Apart from this its primary concern is attaining the reliability of simulation by means of necessitating the changes that are to be enhanced. The predominating big issue in NS3 is its comparison to NS2. It is created with the intention of reproducing

the successful mode of NS2. It is due to this various lot of organizations of elite classes contributed to this model and its components based on the framework of NS2. They both have unlike software core; NS3 is comparatively more attentive to realism. It has Integrated software and is more supportive of virtualization. They both have dissimilar software core. NS3 is comparatively more attentive to realism. It has integrated software and is more supportive of virtualization. The NS3 simulator is the third and improved version of network simulator. Unlike the second version of network simulator known as the NS2 this NS3 is a discrete-event network simulator aimed to benefit the research and educational purposes.

### **Dynamic Destination-Sequenced DistanceVector Routing Protocol**

The Destination-Sequenced Distance-Vector (DSDV) Routing Algorithm is based on the idea of the classical Bellman-Ford Routing Algorithm with certain improvements. Every mobile station maintains a routing table that lists all available destinations, the number of hops to reach the destination and the sequence number assigned by the destination node. The sequence number is used to distinguish stale routes from new ones and thus avoid the formation of loops. The stations periodically transmit their routing tables to their immediate neighbors. A station also transmits its routing table if a significant change has occurred in its table from the last update sent. So, the update is both time-driven and eventdriven. The routing table updates can be sent in two ways - a "full dump" or an incremental update. A full dump sends the full routing table to the neighbors and could span many packets whereas in an incremental update only those entries from the routing

table are sent that has a metric change since the last update and it must fit in a packet. If there is space in the incremental update packet then those entries may be included whose sequence number has changed. When the network is relatively stable, incremental updates are sent to avoid extra traffic and full dump are relatively infrequent. In a fastchanging network, incremental packets can grow big so fulldumps will be more frequent. Each route update packet, in addition to the routing table information, also contains a unique sequence number assigned by the transmitter.

### Literature Review

**Stephen Twumasi Annan (2019)** The study assessed the inquiry method on students' academic achievement in biology in Mawuko Girls School in Ho Municipality using quasi-experimental pre-test and post-test non-equivalent control group design. It employed lecture teaching method as a control to established the variation between the lecture teaching method and that of inquiry. Second-year students offering biology were used for the study. Two research questions and two hypotheses were tested at 5% level of significance. The sample size of the study was 101 second-year biology students drawn by purposive sampling technique from the school. The classes used for the study were selected by simple random sampling using the ballot method. Mean, grand mean, standard deviation and t-test statistic were used to analyze data from the result of a Researcher Made Biology Test (RMBT) used for data collection. The results show that there was a significant difference between the achievements of students taught with the inquiry method and those taught with lecture method in favour of inquiry ( $p \leq 0.05$ ). There was,

however, no statistically significant difference between the mean pretest scores of the experimental and control groups used for the study ( $p > 0.05$ ). The mean post-test scores show a wide difference. Inquiry method proved more effective than lecture method in enhancing students' academic achievement in biology. Workshops, seminars and refresher courses on inquiry teaching and learning are therefore recommended for teachers and educational instructors to build their competency levels. Also, laboratories, as well as other infrastructure that supports inquiry learning, should be made available to the school.

**Anthony Oboite Solomon (2018)** This research work x-rayed the use of library resources in secondary schools in Esan North East Local Government Area of Edo State. The research instrument was the questionnaire; and 195 copies of it were administered, while 190 were retrieved and analyzed. Having adopted the descriptive survey research method, the research found out that the library resources available in the secondary school libraries are monographs (textbooks), dictionaries, atlases, magazines newspapers, CD-ROM, audio-visuals and fictions (storybooks, novels, cartoons); of the available library resources, those mainly used by students are monographs (textbooks), dictionaries, newspapers, atlases. Also the research found out that improvement in academic performance, life-long learning skills, information seeking skills, self-study skills are some of the effects the use of school libraries has on the students. The research recommended that school students should be enlightened on the importance of the library, and the organized private sector should partner with schools to sponsor

library projects as part of their corporate social responsibilities.

**Gabriel Gorghiu (2015)** The research conducted in recent years illustrates that traditional teaching generates a real passivity among students, who are placed in the position of ready-made knowledge consumers, their only effort being oriented to secure and, subsequently, reproduce the knowledge in the context of evaluation tests. Traditional teaching practices may not have a learning effect than a superficial one, which result come as inconsistent and possible to be used only in immediate instructional contexts. In this sense, problem-based learning (PBL) - often known as inquiry-based learning - represents an effective way of working with students who may thus be helped to build basic skills in various domains or curricular areas. Generally, the method involves a central question (problem), proposed and explained by the teacher, with the students working cooperatively and deciding for the proper strategy with the view to solve the problem. The paper presents the results of the implementation in the classroom of 17 Modules which involve problem-based learning paradigm. The Modules were created by teachers enrolled in the continuous professional development programme named "PROFILES - Education through Sciences", organized in the frame of the Seventh Framework Programme "PROFILES - Professional Reflection Oriented Focus on Inquiry-based Learning and Education through Science". The feedback collected from teachers and students was positive, with important achievements in students' understanding of Science concepts, but also in taking ownership of their learning.

**E. M. Aanu (2011)** This study investigated combined and relative influences of use of library resources and study habit on science achievement of the junior secondary school students in Ogun State, Nigeria. Three hundred and sixty (360) students randomly selected from twelve secondary schools in Ogun State participated in the study. Three instruments were designed and used for data collection. Use of library resources and study habit combined together to significantly influence science achievement ( $R^2 = 0.061$ ,  $p < 0.05$ ). There is no significant difference between male and female students' use of library resources, study habit and science achievement. The school counsellors should train students on effective study techniques in order to foster science achievement.

**Y.M. Adekoya (2011)** This study investigated the effect of three teaching strategies; demonstration, peer-tutoring, and lecture strategies of teaching on students' achievement in pasture and forage crops which is an aspect of agricultural science. Lecture strategy served both as a teaching strategy as well as control since it is assumed to be a conventional strategy of teaching. A 3X2X2 pre-test, post-test experimental design with a control group was used in which a hundred and fifty randomly selected Senior Secondary School II (SSS II) Agricultural Science students were drawn from three schools.

### Methodology

Descriptive survey research design has been adopted for this research. The population of this study comprises all senior secondary school students of the two secondary schools with functional libraries in Esan North East Local



Government Area in Edo State with functional libraries. The research instrument adopted for this study is the questionnaire, and the collected data were analyzed using tabulation and simple percentage analysis, for easy comprehension. From the responses, the respondents admitted that the available library resources in their school libraries are: monographs (textbooks); dictionaries; atlases; magazines; newspapers; CD-ROM; audio-visuals; fictions (storybooks, novels, cartoons); and librarians. In all these the ones mainly used by students are monographs (textbooks); dictionaries; newspapers; atlases; librarians; fictions (storybooks, novels, cartoons); magazines; audio-visuals; and CD-ROM. The findings agree with those of Bonard and Dulle (2014) who said the range of library resources used in the library cannot be limited to only textbooks. The research findings also agree with those of Fakomogbon, et al., (2012) who observed that the library resources used in libraries in Ilorin Metropolis include textbooks, reference materials, serials and audio-visuals. The research findings show that the effects of using secondary school libraries on students are: improvement of their performance during test and examination; learning lifelong learning skills; developing information seeking skills; learning self-study skills; and in contrast however, most of them are of the opinion that they don't need the library to excel in their studies. For these set of respondents, they feel they can excel in their studies by using only their textbooks when reading or studying. This could probably be because they feel the school library is not well equipped.

## RESULTS

In Table 3 there is significant main effect of treatment on students' achievement in an aspect of agricultural science that is, pasture and forage crops [ $F_{2, 137} = 7.072$ ;  $p < 0.05$ ]. Thus, gender (whether students are males or females) does not influence achievement in an aspect of agricultural science. Likewise, self-concept does not have significant main effect on achievement in an aspect of agricultural science (pasture and forage crops) [ $F_{1, 137} = 0.311$ ;  $p > 0.05$ ].

**Table 3: ANCOVA of Effect of Treatment and Moderating Variables on Students' Achievement in an Aspect of Agricultural Science.**

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	468.117	12	39.010	3.62	.000
Intercept	622.803	1	622.803	57.9	.000
Agric-pretest	170.376	2	170.37	17	.001
treatment	170.376	1	3	15.8	*
gender	76.051	1	76.051	44	.456
self-concept	152.102	2	5.999	7.07	.578
treatment	3.348	2	3.348	2	.572
gender	5.999	1	6.028	.558	.869
self-concept	3.348	1	1.507	.311	.587
treatment	12.057	2	3.184	.561	
gender	3.013	137		.140	.628
treatment	3.184	150	5.026	.296	
self-concept	3.184	149	10.753	.467	
gender x self-concept	10.052				
self-concept	1473.216				
treatment					

x gender x	2053				
self-	4.000				
concept	1941.				
Error	333				
Total					
Corrected					
Total					

\*Significant ( $p < 0.05$ )

Two-way interaction effect of treatment and gender does not have effect on achievement in pasture and forage crops [ $F_{2, 137} = 0.561$ ;  $p > 0.05$ ]. Since the main effect of treatment is significant but the interaction effect with gender is not significant, it then means that the treatment does not depend on gender to be effective. In other words, the treatment is not gender sensitive and will be effective irrespective of students' gender. Also, two-way interaction effect of treatment and self-concept on students' achievement in an aspect of agricultural science is not significant [ $F_{2, 137} = 0.140$ ;  $p > 0.05$ ]. This implies that the treatment will be effective irrespective of student self-concept (either high or low). Similarly, gender and self-concept have no significant interaction effect on students' achievement in an aspect of Agricultural Science [ $F_{1, 137} = 0.296$ ;  $p > 0.05$ ]. Three-way interaction effect of treatment, gender, and self-concept has no significant effect on students' achievement in an aspect of Agricultural Science [ $F_{2, 137} = 0.467$ ;  $p > 0.05$ ]. Thus, the treatment will work irrespective of students' gender and self-concept. In summary, all the null hypotheses are being upheld except hypothesis one that states: there is no significant main effect of treatment on

students' achievement in an aspect of Agricultural Science (Pasture and Forage Crops).

**Table 4: Univariate Tests of the Mean Scores of the Three Groups.**

	Sum of Squares	Df	Mean Square	F	Sig.
Contrast	152.2	2	76.051	7.07	.001
Error	102	137	10.753	2	*
Total	1473				
Corrected Total	.216				

\*Significant ( $p < 0.05$ )

**Table 5: Pair-Wise Comparison of the Three Groups.**

(I) treatment (J) treatment	Mean Difference (I-J)	Std. Error	Sig.
Lecture	.379	.723	.601
peer-tutoring	-2.021	.726	.006
demonstration			
Peer-tutoring	-.379	.723	.601
lecture	-2.400	.678	.001*
demonstration			
Demonstration	2.021	.726	.006
lecture	2.400	.678	.001*
peer-tutoring			

\*The mean difference is significant at the .05 level

## CONCLUSION

In our society, modern technology involves agricultural science. Learning agricultural science leads to the development of thinking skills and understanding of the other sciences. Demonstration teaching strategy has been found challenging but can be evaluated as a rewarding exercise and an overall success as a result of its capability to help the students learn to develop the ability to

think critically and analytically. A high degree of independence is required as the students have to learn how to identify resources and how to communicate effectively and this no doubt helps the learners to comprehend abstract concepts. The demonstration teaching strategy in this paper produces significantly better performance in the Agricultural Achievement Test than the peertutoring and lecture teaching strategies. Thus, demonstration teaching strategy is an effective mode of instruction for students in the secondary schools. However, a teaching method is seldom used alone. In a typical lesson, an effective instructor normally uses more than one method. The findings of this study has revealed that demonstration and peertutoring teaching strategies can be used for teaching and learning processes depending on the topic but demonstration strategy is the most effective because it afforded the students the opportunity to study on their own. Thus, while making attempts to improving the utilization of the regular school hours of the students; the provision of learning by "doing" is a strategy that could be adequately employed in our classrooms. This paper concludes that the use of demonstration method of teaching should be embraced by all senior secondary school science teachers.

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