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Editorial

Significant events

Donald G. Perrin

If you were asked, "What are the three most significant events in the history of Instructional Technology, what would you choose? Here are mine… (Criticism and discussion is encouraged.)

A: Birth of instructional technology

Where would you start?

1) 1970: Publication of "To Improve Learning" by the Commission on Instructional technology.
2) 1961 Charles Hoban and James Finn: "Audiovisual" is too limiting and inaccurate. They proposed "instructional technology" to encompass new educational theories, practices, methods and media.
3) 1957 Sputnik followed by massive federal funding for educational research, curriculum development, and educational technologies through National Defense and Education Act (NDEA).
4) 1900 and before – cave paintings, *camera obscura*, illuminated manuscripts, printing press, lantern slide projector, photography, slate, blackboard, telegraph, telephone, phonograph, radio, motion picture.

My choice is #2.

Until 1960, audiovisual focused on instruction for large groups. Films and filmstrips were used extensively for military training during World War II, complemented by research to determine how to use these media to optimize learning (Hoban and Van Ormer). Starting in 1960, NDEA funds accelerated innovations for individualized and interactive learning with language laboratories, teaching machines, programed learning, and instructional use of computers.

Distance education was stimulated by experimentation with closed circuit and broadcast television. In 1951, the Ford Foundation gave its first grant to the public broadcasting system then known as National Educational Television. In the 1960's it funded research with closed circuit television in Hagerstown, Maryland and Anaheim, California to place the best teachers in front of thousands of students simultaneously. Starting in 1963, Instructional Television Fixed Service enabled schools and colleges to broadcast using line-of-sight technology.

Later there was experimentation with two-way television, mainframe computers, and interactive multimedia. However, as Federal support decreased, many innovative programs started in the sixties were terminated and schools and colleges returned to previous methods of teaching in the classroom.

B. What was the next milestone in development of educational technologies?

1) 1958 Captioned Films for the Deaf
2) 2.1969 The Open University
3) 1972 First Joint Library-Media Credential, University of Maryland
4) 1980 Personal computers
5) 1990 Educational use of the internet with web browsers

My choice – 4 &5 together.

Captioned films broadened its scope to support learners with disabilities. In the 1980s, mainstreaming integrated students with minor disabilities into regular education classrooms. This made learning resources developed for special education available to a larger number of students. Closed captioning on television proved valuable for second language learners. Thus, captioned films initiated a series of actions to integrate minority and disadvantaged groups into American society.

The Open University in Great Britain, also accredited in the United States, is noted for quality open and distance learning programs using the internet, teleconferencing and related media. With global reach, it is recognized for the high quality academic programs. The success of the Open University stimulated

widespread development of distance learning programs in universities and colleges worldwide. More recently this has been extended to secondary and primary education.

The Joint Media-Library Credential recognized the need to integrate a wide range of learning resources. This positioned libraries for the extension of information technologies through computers.

The advent of the personal computers caught the imagination of teachers, administrators, parents and politicians. This stimulated government funds and philanthropy at an unprecedented level, first for computers, printers, software and courseware, and later for networking and internet connections. The major impact was to equip classrooms with digital display systems, provide computers in libraries, and in the next decade, provide internet access to libraries classrooms and laboratories. Many educational institutions did not have sufficient budget to maintain their computers and software so that they rapidly became obsolete.

In the 1990s, the Internet became available to schools and colleges. By the middle of the decade, web browsers with graphic user interfaces made it possible for almost everybody with an internet connection to use the internet for daily communications such as email, search for information and access resources via the Internet. Now the lack of courseware was less of a problem because of widespread sharing of educational materials among teachers on diskettes, CDs and via the internet.

C. The third milestone was a step backward

1) 1998 Digital Millennium Copyright Act
2) 2000 Collapse of the Dot.com boom.
3) 2007 Collapse of global economies
4) 2010 ISIS Reign of Terror

My choice – 1. We are already recovering from 2, 3, & 4.

The connectedness, sharing, and broad access to educational media among teachers and via the Internet suffered a giant setback with the passing of the Digital Millennium Copyright Act of 1998 (DMCA). This law "criminalized the production and dissemination of technology, devices, or services of measures that control access to copyrighted works … and heightens penalties for copyright infringement on the Internet." Its "fair use" provisions to facilitate education, distance education and libraries, had exactly the opposite effect. It was ambiguous and threatening. It fortified privatization of knowledge and stifled teachers whose working environment was already overloaded, impoverished, unfairly criticized, and excessively regulated.

Wikipedia and open learning systems have proved a productive alterative to privatization. Based on the Creative Commons Copyright, they were a direct response to this oppressive legislation. Howevcer the net result has been a loss to education and economic development. In 2010, the Electronic Frontier Foundation documented harmful consequences of the DMCA as: *stifles free expression; jeopardizes fair use; impedes competition; and interferes with computer intrusion laws*.

D. An unexpected benefit

Even though public funding for education and instructional technologies has sadly diminished, unprecedented access to computers and mobile devices at home and in libraries has provided Internet access for a large segment of the population. This may not directly support what is happening in the classroom, but it does enable self-directed learning anywhere-anytime, and self-directed learning may well become the new paradigm for education. (*see* An assessment of self-directed learning effectiveness among open and distance learners in Nigeria by Dr Osuji, page 13 in this issue).

Boatner, Edmond Burke. Captioned Films for the Deaf. https://www.dcmp.org/caai/nadh93.pdf

Digital Millennium Copyright Act. Wikipedia. http://en.wikipedia.org/wiki/Digital_Millennium_Copyright_Act

Hoban and Van Ormer (1953). Instructional Film Research Reports (Rapid Mass Learning). Office of Naval Research, Special Devices Center, Port Washington, NY

Tickton, Sidney G. (Ed.) (1970) To Improve Learning: An Evaluation of Instructional Technology. Bowker.

Electronic Frontier Foundation (2010)."Unintended Consequences: Twelve Years under the DMCA".

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Editor's Note: T*his paper is a significant contribution to educational research, theory and practice.* It involves chaos theory, complexity theory, and non-linearity as alternatives to Newtonian models for predicting outcomes. It describes practical applications of these alternative theories to very large internet courses, MOOCs, for higher education programs in Engineering. The potential impact of non-linear approaches to achieve deterministic outcomes may be truly revolutionary!

Metaphors of Chaos Theory for MOOCs and Engineering Education

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China

Abstract

This paper presents concepts of chaos theory for developing a framework for rapidly emerging form on online education—Massive Open Online Courses (MOOCs) in engineering. The massive online courses are the latest installment in the field of distance education. Since 2012, many universities have joined the MOOC revolution and the number of MOOCs is increasing. Due to their access to large audience and low cost, MOOCs may expand admission to education at all levels, improve student learning and increase public awareness. Metaphors of chaos theory can be used in education because a MOOC classroom is a complex dynamical system.

Keywords: Chaos theory, engineering education, MOOCs, nonlinear dynamics, online learning.

Introduction

Online learning is not a new phenomenon. In 1989, The University of Phoenix launched its online degree program [1]. However, since 2011, when Sebastian Thrun and Peter Norvig conducted a MOOC, free online courses have reached an unprecedented scale and the New York Times dubbed 2012 as the "Year of the MOOC [2]." The acronym 'MOOC' has made Oxford online dictionary. It defines MOOC as *"a course of study made available over the Internet without charge to a very large number of people* [3]." MOOCs have recently caught a great media attention. They have been dubbed revolution [4], the campus tsunami [1], faducation [5], McDonaldization of global higher education [6], and false promise [7].

Fig. 1 MOOCs are a fascinating development [8]

Classical physics based on the Newtonian model emphasized determinism and linearity. Behavioral psychology adopted this linear view of the physicist. Newtonian physics served as the model for early developments in the sciences. It suggested a universe that contained order, determinism, regularity, predictability, and precise measurement. All of these constructs have been called into question by the development of chaos theory [9].

The educational model for the industrial age focused on linear transmission of knowledge and information. Traditional learning assessment is based on linear metaphors. The nonlinearities of social interaction and human mind render the linear teaching paradigm deeply flawed and ineffective in the information age. Our educational institutions are complex, dynamics, and organic systems. Chaos theory offers useful metaphors for examining teaching-learning process. Little things teachers do or say in classrooms may end up having large unpredicted effects [10].

Deterministic Chaos against Determinism

Chaos theory (previously called nonlinear dynamics) is relatively a new mathematical concept. Chaos theory is the result of discoveries in the field of nonlinear dynamics. The study of the temporal evolution of nonlinear dynamical systems is called "Nonlinear dynamics". Heinz Pagels has noted, *"Life is nonlinear, and so is just about everything else of interest* [11]." Chaos theory is the mathematical study of chaotic systems and their behaviour. Chaos theory deals with deterministic processes which look random but whose dimension is finite.

Greek philosophers developed this premise that universe is deterministic (and predictable) and the main aim of scientists is to find the deterministic rules for prediction and control. The Newtonian dynamics governed every sphere of life since 1686. The triumph of the Newtonian deterministic worldview led to the philosophy of determinism; the systems dynamics can be predicted for all time knowing the initial conditions and differential equations of systems [12]. About two centuries ago, Pierre Simon de Laplace advanced Newton's doctrine as [13]:

> Given for one instant an intelligence which could comprehend all forces by which nature is animated and the respective situation of the beings which compose it—an intelligence sufficiently vast to submit these data to analyses—it would embrace in the same formula the movements of the greatest bodies and those of the lightest atom; for it, nothing would be uncertain and the future as the past would be present to its eyes.

This passage is a classic narrative of a clockwork universe. This universe obeyed deterministic rules, which could be used to explain linear, causal relationships of all occurrences. About a century later, Henri Poincaré, another French mathematician, suggested that the universe actually behaved quite differently [14]. He articulated the chaos theory notion of the "butterfly effect" – that is, sensitivity to initial conditions as:

> Even if it were the case that the natural laws had no longer any secret for us, we could still only know the initial situation approximately. If that enabled us to predict the succeeding situation with the same approximation, that is all we require, and we should say that the phenomenon had been predicted, that it is governed by laws. But it is not always so; it may happen that small differences in the initial conditions produce very great ones in the final phenomena. A small error in the former will produce an enormous error in the latter. Prediction becomes impossible.

Hence, Poincare was the first scientist who realized the failure of predictability in Newtonian mechanics. Edward Lorenz is credited with beginning the contemporary interest in Chaos theory. He concluded that small changes in a system could make large differences later. Deterministic chaos deals with dynamical systems which exhibit apparently random behavior. But they have an underlying order (geometry). Sensitive dependence on initial conditions is the technical name of phrase the 'butterfly effect' coined by Lorenz. Butterfly effect is the phenomenon whereby a very insignificant change in a complex system can significantly alter an anticipated course of events. In 1986, Sir James Lighthill (who held the same Lucasian Chair of Mathematics at Cambridge that Newton once occupied) published a remarkable collective apology on behalf of all scientists [15]:

> We collectively wish to apologize for having misled the general educated public by spreading ideas about the determinism of systems satisfying Newton's laws of motion that, after 1960, were proved to be incorrect.

In the last century, Laplace's dream shattered in the physical sciences. Chaos theory has a great impact on scientific thinking. The main consequence of chaos is that complex behaviors sometimes have simple causes. Famous theoretical biologist, Robert May stressed the educational significance of studying nonlinear dynamical systems to balance the misleading linear intuition advanced by traditional learning in his celebrated review article. He highlighted that even simple nonlinear mappings could produce complex dynamics. The paper ends unforgettably with an evangelical plea for the induction of nonlinear dynamics into primary courses as [16]:

> Not only in research, but also in the everyday world of politics and economics, we would be better off if more people realized that simple nonlinear systems do not necessarily possess simple dynamical properties.

MOOCs: Background

The printing press was the largest innovation in education. Since then experts labeled every invention: backboard, radio, motion picture, television, computers and Internet as the most important innovation that will transform education forever [17]. The Internet has revolutionized university education through adoption of educational softwares, electronic books, web-based course management systems, research papers and numerous Information and Communication Technologies (ICTs) [18]. These developments complement traditional on-campus teaching.

In 2002, the UNESCO forum coined the term OER for education content that may be freely accessed, shared, modified, and reused. In 2002, Massachusetts Institute of Technology (MIT) initiated MIT OpenCourseWare (MIT OCW) as open educational resources (OER). Viewed in this way, MOOCs are a step forward in evolution of OER. From the OER movement, the first MOOC—Connectivism and Connective Knowledge (also known as CCK08) emerged in 2008. At the University of Manitoba, George Siemens and Stephen Downes designed and taught this first MOOC. This MOOC used an open peer-learning model and enrolled a small number of paying students and over 2,000 online learners.

In 2006, Salman Khan taught mathematics to his cousins over the Internet. MOOCs are largely inspired by the open-access online resources offered by the Khan academy, TED, iTunes and YouTube. The seeds of this revolution were planted with the introduction Internet in 1989 [19].

Eminence of MOOCs

In IEEE CS 2022 report, IEEE Computer Society brainstormed twenty-three potential technologies that could change the world by 2022. MOOCs will complement the current instruction models and become part of education ecosystem. Often drawing tens of thousands of learners to a single section, MOOCs offer free, high quality, university education to anybody with Internet access. MOOCs have opened up learning opportunities and given masses access to knowledge that was previously unimaginable. Only education has the potential to lift people out of poverty [4]. MOOCs are vehicles for democratizing higher education [17]. Requiring only a computer and Internet access to enroll, and intrinsic motivation MOOCs can be used for continuing education courses and credit-bearing undergraduate courses, leading to degree programs and even graduate education [8].

MOOCs are a new breed of online classes, which allow learners around the world to participate through short video lectures embedded with quizzes, automated MCQs tests, peer evaluation and discussion for free. Research has shown that students learn important concepts efficiently through a strategy of grouping items into smaller chunks [20]. Hence, this new online pedagogy in higher education may augment or replace the millennial tradition of lecturing.

Using online technologies, MOOCs can transform education in access, quality, and scale. The millennial generation is at home with online technologies. The instructors are flipping the classroom—blending online and in-person learning and the results are encouraging. Research suggests that online education is as effective as in-class learning. Based on 45 studies a report of Department of Education suggested that online education is as effective as face-to-face learning and blended instruction is more efficient than either [21]. The concept of flipped classroom existed before MOOCs. However, now it will enable teachers to spend less time lecturing and more time interacting with learners. It will provide insight into personalized human learning and blended education. MOOCs will help us identify new ways to think about online education.

In traditional residential courses, students passively absorb lectures and lack rapid feedback. Students opportunities to ask questions are limited. Mark Twain complained about lecture-based format as, *"College is a place where a professor's lecture notes go straight to the students' lecture notes, without passing through the brains of either."* MOOCs are based on active learning, instant feedback, self-pacing, and peer learning. Students learn better, when they are interacting with the material and at their own pace. In MOOCs, students actively engage the learning material, avoid long-standing misconceptions and self-pace the learning process [22]. Like the monolithic hour-long lectures, students cannot learn by passively watching short videos. Personalization and active learning is a great opportunity provided by MOOCs.

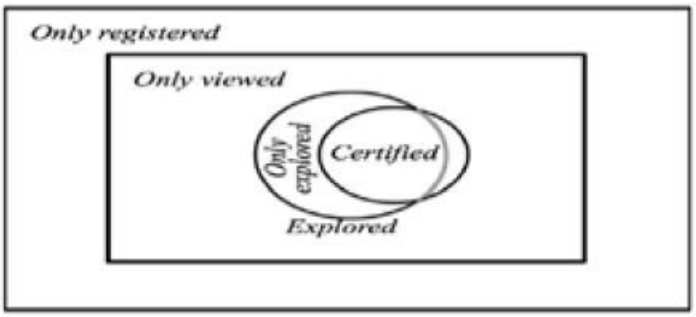
Instant feedback converts teaching moments into learning outcomes. As opposed to lectures, the video content is based on Khan-style of tutoring. Benjamin Bloom showed us that one-to-one learning works best [23]. On online discussion forums, students could ask questions and receive real-time feedback. Eric Mazur told us that peers could be the best teachers [24]. Besides educating people, MOOCs may improve residential education by allowing teachers to focus on high-value tasks [22]. The blended model can help revolutionize education. MOOCs have created opportunities for innovation in information delivery and knowledge assessment. These online platforms will also reform on-campus learning [22].

Student learning is enhanced by interacting with course material and quizzes embedded within video lectures. Students can interact with fellow class members by discussion, which improves inter-cultural understanding and starts international dialogue [18]. Outside brick-and-mortar classrooms, MOOCs offer immense opportunities for lifelong learning, adult education and vocational training. Teachers are a big audience of MOOCs. edX has joined Obama's initiative ConnectED [25]. Teacher training is important because teachers pass on to their own students what they learn [26].

Student assessment is a major limitation of MOOCs. The assessment in MOOCs is either crowd-sourced or computer-graded. Peer assessment potentially enables large classes to offer assignments that are impractical to grade automatically. Furthermore, human grading more easily provides context-appropriate responses and better handles ill-specified constraints. Peer assessment can increase student involvement and maturity, lower the grading burden on staff, and enhance classroom discussion. The fundamental limitation of peer assessment is that peers and experts may interpret work differently [27].

MOOCs have two basic models. cMOOCs are the original MOOCs based on Connectivist pedagogy. They have less content and structure and depend on social learning, autonomy and chaos for knowledge creation. They tend to have a network-based, decentralized, non-linear structure focused on exploration and conversation rather than emphasizing instructor-provided content. Whereas, xMOOCs have been designed for mass teaching, they are generally related to more traditional pedagogical approaches [28]. These online courses are teacher-centered in curriculum-driven.

From a residential frame-of-reference, a professor may take decades to teach the equivalent number of online students. Similarly, online courses are different in content design and structure. Registrants have been engaging with courses in diverse ways. Beyond course certification, some learners simply watch videos or read content, see Figure 2 [29]. I have attended a number of MOOCs and experienced a range of teachers from monotonous monologues to outstanding performances. Initially very few papers were available on MOOCs but now a lot of literature is accessible.



Only Registered: Registrants who never access the courseware.

Only Viewed: Non certified registrants who access less than half of the available chapters.

Only Explored: Non-certified registrants who access more than half of the available chapters in the courseware.

Certified: Registrants who earn a certificate in the course.

Fig. 2 Four mutually exclusive and exhaustive categories of course registrants [29].

Strengths and bottlenecks for MOOCs

Student completion rates rarely exceed 10% of enrolled students, which may include the curious as well as committed and ill-prepared students. These completion rates are an order of magnitude lower than in a traditional college course. The high tuition fees make higher education unaffordable for common people. In President Obama view, online courses have the potential to reduce the rising cost of higher education [30].

In a traditional course, the student pays a certain tuition fee, which becomes a powerful motivation for completing it. However, MOOCs lack such motivation because they are free. MOOCs attract new students, life-long learners and some seeking career changes. Top universities can display their best teachers and latest research.

Student verification will be an interesting feature of MOOCs [31].

> At San Jose State University (SJSU), teachers refused to teach an edX MOOC saying, *"They do not want to enable what they see as a push to replace professors, dismantle departments, and provide a diminished education for students in public universities."* The imposed widespread use of MOOCs may damage departments in public universities facing budgetary cuts [26, 32].

Critics argue that MOOCs lack sufficient student-teacher interaction and campus life, which are integral part of university education and the mere exposure to information in MOOC learning experience does not lead to personal growth and assimilation of knowledge [33]. Herd instinct is obvious as the universities around the world are joining the MOOC bandwagon. For most universities, it appears to be opportunism or merely utter confusion about modern online learning. We must remember our lessons from history as George Santayana said, *"Those who cannot remember the past are condemned to repeat it."* Educational technologies are faddish like many other areas of human activity [34].

MOOCs: Present status and future expectations

Major MOOC providers include Coursera, edX, Udacity, iversity, Udemy and FutureLearn. Coursera has been featured in 'Forbes' magazine [35]. Coursera has so far registered ten million enrollments and MOOC provider Futurelearn has attained a one-million learner milestone [36]. The edX platform has been collecting a large amount of data per course [29]. All homework submissions and forum posts are being collected. The data analysis will provide a new look into human learning. MOOCs have spawned a lot of discussion. They have accelerated innovation in online pedagogy, data analysis, and prediction analysis [37].

Currently, most MOOCs are taken as non-credit bearing, though several universities have been finding ways to award credit to MOOCs. Antioch University is the first US institution to receive approval from Coursera to offer college credit for specified MOOCs [38]. The Georgia Institute of Technology was the first university to introduce a whole MOOC-based degree [39]. In future, most universities will either directly participate in MOOCs for credit and non-credit courses or grant certain allowances to those who complete MOOCs. Currently MOOC are offered to the undergraduate market, but there will probably be a limited number of professional-, graduate-, and even doctoral-level MOOCs. While online or remote delivery of college course content has been available for many decades, MOOCs differ in terms of scale and no cost [8]. Advocates believe that MOOCs may abolish the centuries-old model of education.

Whether the MOOC is hosted by a not-for-profit entity or a for-profit business, the finances have to make sense. It takes significant investment to build and maintain the MOOC platform, fill course content and pay support staff, teaching assistants, and professors. Some small financial successes have been reported, but no one has figured out how to make the finances work for MOOCs once they scale up and for the long run.

The prospect of achieving huge economies of scale is alluring to deans and college presidents. High-quality courses can be delivered to underserved and far-flung populations, and in developing countries, which will have enormous societal impact. MOOCs may transform higher education. But there are significant unresolved issues relating to educational quality and financial sustainability [8].

MOOCs are familiar steps in a process called "disruptive innovation" that has taken place in many industries from accounting to computers. This disruptive innovation could improve the declining state of education and shrinking budgets [40]. MOOCs may change the landscape of education enterprise across the whole range of undergraduate and graduate engineering programs. With no tuition required, the convenience of online learning, and access to excellent faculty, MOOCs have the potential to draw vast numbers of students away from traditional bricks-and-mortar universities. A significant migration of students to MOOCs would threaten the viability of some traditional colleges and universities. MOOCs also threaten to change the role of faculty, student, and the nature of the university [8].

Implications of Chaos Theory in education

For three centuries, the predictable clockwork philosophy has been the dominant credo. The Newtonian worldview profoundly influenced our behavior, psyche, belief and institutions. In the Newtonian worldview, an effort was made to describe the world by breaking complex systems into smaller entities so they can be easily understood and controlled [41].

With the focus of chaos theory on nonlinearity, uncertainty, and instability, the application of this theory to the social sciences was perhaps a predictable eventuality. Chaotic behavior, while occurring within defined mathematical parameters, appears random and without pattern over time. However, it is not random behavior, since it can be generated with a completely

deterministic equation. Chaotic behavior occurs within defined parameters [11]. Chaos theorists try to find order within disorder; they endeavor to find patterns in dynamical systems.

Human behaviors evolve from nonlinearities. Before computers, when mathematical solutions were the only available technique, necessity imposed a tradition of ignoring nonlinearity. The tradition of linear thinking has become so firmly established that it has diverted most researchers from even recognizing the importance of nonlinearities. In nonlinear systems, results are less simple, but more relevant. Social scientists can understand the world better by appreciating complexity and adopting new nonlinear analysis and modeling approaches [42]. Table I compares key notions of linearity and chaos approach.

Table 1
The linear and chaotic worldview

Linear	Chaos
Seeks to predict	Recognizes that many occurrences are sudden and unpredictable
Amount of input is proportional to expected output	Small input may have a much greater output
Values stability and equilibrium	Values turbulence and "far from equilibrium" conditions
Takes apart to look at component parts (reductionism)	Views entities and phenomena holistically to discover underlying pattern
Views effect as result of singular cause	Views effect as result of multiple causes
Does not take context and connections among entities into consideration	Recognizes influence of context and interconnectedness of multiple variables
Seeks to solve problems by control	Recognizes that control efforts may lead to intensification of the problem
Seeks simple rational solutions	Addresses complex problems without simple solutions

Many educators consider teaching-learning process to be a complex activity. Despite the best-developed class management techniques and lesson plan, the class is always subjected to many unpredictable factors. Teachers must accept uncertainties as a natural condition and prepare themselves for all eventualities [43]. Metaphors drive theory and practice of education. The metaphor of Newtonian determinism has failed social sciences. Education is a social process and, in the language of chaos theory, it is one of the arrows in time, an arrow guided and directed by human choices. The metaphors of Chaos theory have been used in different facets of education like teacher training, curriculum, classroom, etc. [44].

Building on some key features of nonlinear dynamical systems described like nonlinearity, sensitive dependence on initial conditions (SDIC), and strange attractor the author finds these metaphors relevant to teaching and learning MOOCs. Butterfly effect proposes that just a small change in the initial conditions can severely change the lasting behaviour of a complex system such as weather. Similarly, an unexpected remark from a learner, a slight change in the way the teacher conducts an activity–can have a major impact on the course of the lesson and its overall effectiveness [45]. Chaos theory emphasizes the importance of initial events (conditions). A single event can cause long-lasting effects like low motivation, lack of self-confidence and insecurity among learners [46].

MOOCs appear to be a chaotic learning environment in which properties of connectedness and openness bring about a high degree of complexity and the need for greater self-organization.

Educational researchers have started to employ chaos theory in future frameworks. MOOCs are complex systems activity.

New knowledge is created by processing information and integrating it with prior knowledge. Knowledge acquisition is also a complex process [47]. Neuroscientists told us that brain works in nonlinear path as opposed to digital computers [9].

Hunter and Benson argue that it is neither necessary nor useful to introduce chaos theory to understand education. The indiscriminate application of chaos theory to every kind of complex phenomenon treats it like a fixed set of rules and thus is a misapplication and misinterpretation [48]. Chaos theory, engineering education, and current online education generate and synergetic trinity for preparing future engineering MOOCs that may provide a comprehensive knowledge base and support critical thinking skills [49].

Engineering Education and MOOCs

Engineering education is the activity of teaching theory and principles related to the professional practice of engineering. Concept building is very important for engineering students [50] so the laboratories are a distinctive part of engineering education. Practice is the key in engineering profession. In engineering courses, student attendance in laboratories is necessary, as the theory must be augmented by the hands-on training.

Computer simulation is a substitute for expensive laboratories. For data collection and data acquisition, engineers perform computer simulations. The fundamental advantage of using simulators in engineering education is that they reinforce the student understanding of theoretical concepts using graphical aids. Simulation results highlight the similarities and differences between the theoretical and actual characteristics of devices [12, 51].

MIT and Stanford University offered early MOOCs in Computer Science and Electrical Engineering. Most engineering courses require prerequisites, so initially upper-level engineering courses were virtually absent from MOOC list. However, engineering courses at undergraduate and graduate levels are now being offered [52] by a number of universities. Many instructors have reported successful outcomes by flipping the engineering classrooms around MOOCs [52, 53]. Virtual and remote laboratories can fill the theory-to-practice gap. The main bottleneck is the production of video lectures [19]. The instructor has to spend a great amount of time to prepare a course for the online environment [54].

Integration of Chaos in Engineering Education and MOOCs

Current engineering education is deeply rooted in the scientific paradigm of the past - determinism. Determinism tells us that the accurate future predictions can be made if we have reasonable knowledge of the current conditions. The engineering education has been mostly highlighting linear modeling for decades because linear systems theory has been widely cultivated and mathematical tools are used for analysis. This philosophy ignores many observed intricate dynamics because it cannot elucidate them. Chaos theory is a fascinating new area of modern science, which is transforming our understanding of nature [55]. The apparent paradox of randomness appearing in simple deterministic systems has made investigators believe that a deeper understanding of deterministic chaos has the potential for explaining problems when analytical predictions and experimental results differ (see Figure 3).

Deterministic chaos can be integrated into undergraduate engineering curriculum at different levels and in multiple ways [12, 56]. In a numerical analysis course, logistic maps can be taught as exemplar of chaos [57]. In electronic devices and circuits, major concepts of chaotic dynamics can be introduced [58-60]. In mathematical modelling course, instead of reductionist approaches, chaos-based modelling may prove useful.

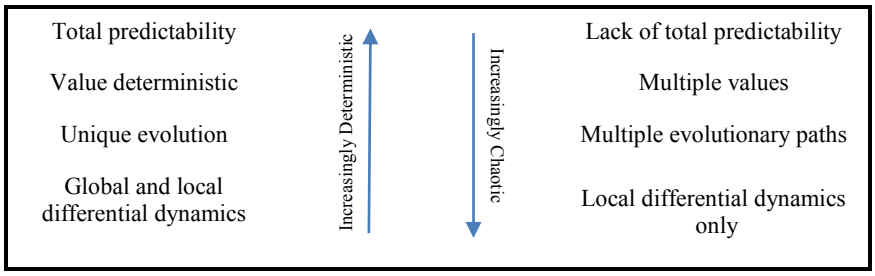


Fig. 3 Determinism vs. Chaos: comparison and contrast [56].

The integration of chaos theory will develop dynamic, holistic thinking instead of static, reductionistic thinking. It will encourage multidisciplinary studies; it will promote synthesis and analysis. As educators, we must nurture analytical (left-brain) thinking skills and creative (right brain) skills. We should re-imagine our engineering curricula [56].

Conclusion

Current MOOCs are great educational experiment. Beside their role in higher education, MOOCs may be helpful in college and school education. MOOCs have the potential to transform the higher educational landscape, but it is too soon to tell how significant this impact will be. MOOCs will likely play a future role - predominately in continuing education, course prerequisites, and credit-bearing courses. It is possible, that complete credit-bearing courses from accredited universities will be available through MOOCs before 2022.

This paper discusses the role of chaos theory in engineering MOOCs. It also calls for involvement of nonlinear approaches to teaching of thinking. Chaos theory strives to understand complex systems and it considers world as an open system and learning as dynamic, constructive and holistic process. Chaos theory provides useful metaphors for understanding dynamics of MOOCs. It serves as a bridge between the determinism of Newtonian physics and the indeterminism of quantum physics. It leads to an understanding that the world is neither orderly and completely predictable, nor disorderly and random. It can provide educators with an increasingly accurate picture of the nature of teaching and learning.

MOOCs are disrupting traditional education and they may bring major changes in university education in the future. Technology is double-edged sword and its benefits are what we make of it. The implications of these courses are different in different sectors and these implications must be contextualized. MOOCs may transform curriculum and learning. MOOCs are establishing education as a fundamental human right. The world of MOOCs is still in its early years and it is full of possibilities and further innovations. Open online courses are neither worthless nor silver bullets of higher education. MOOC providers have more classrooms coming. It will be an exciting time.

References

[1] D. Brooks, "The campus tsunami," *The New York Times*, vol. 4, pp. A29, 2012.

[2] L. Pappano, "The Year of the MOOC," *The New York Times*, vol. 2, pp. 2012, 2012.

[3] C. Parr, "MOOC makes Oxford online dictionary," *Times Higher Education.[Online] Available: http://goo.gl/cc3Yiw*, 2013.

[4] T. Friedman, "Revolution hits the universities," *The New York Times*, vol. 26, 2013.

[5] A. Barlow, "Faducation? The mooc," *Academe Blog*, 2013.

[6] J. Lane and K. Kinser, "MOOCs and the McDonaldization of global higher education," *education*, vol. 30536, pp. 1, 2012.

[7] S. Carlson and G. Blumenstyk, "For whom is college being reinvented?," *Chronicle of Higher Education*, vol. 17, 2012.

[8] H. Alkhatib, P. Faraboschi, E. Frachtenberg, H. Kasahara, D. Lange, P. Laplante, A. Merchant, D. a. Milojicic, and K. Schwan, "IEEE CS 2022 Report," IEEE Computer Society 2014.

[9] M. J. Rockier, "Thinking about chaos: Non-quantitative approaches to teacher education," *Action in Teacher Education*, vol. 12, pp. 56-62, 1991.

[10] B. Moseley and D. Dustin, "Teaching as chaos," *College Teaching*, vol. 56, pp. 140-142, 2008.

[11] L. D. Kiel and E. W. Elliott, "Introduction," in *Chaos theory in the social sciences: Foundations and* 9

applications: University of Michigan Press, 1997, pp. 1-15.

[12] S. Iqbal, X. Zang, Y. Zhu, X. Liu, and J. Zhao, "Introducing Undergraduate Electrical Engineering Students to Chaotic Dynamics: Computer Simulations with Logistic Map and Buck Converter," presented at 8th Asia Modelling Symposium (AMS 2014), Taiwan, 2014.

[13] P.-S. Laplace, "A Philosophical Essay on Probabilities. Translated from the 6th French Edition by Frederick Wilson Truscott and Frederick Lincoln Emory," Dover Publications. New York, 1951, pp. 4.

[14] H. Poincare, "Science and Method (1914). Translated by Francis Maitland. With a preface by the Hon. Bertrand Russell," Thomas Nelson & Sons, 2010, pp. 68.

[15] J. Lighthill, J. M. T. Thompson, A. K. Sen, A. G. M. Last, D. T. Tritton, and P. Mathias, "The Recently Recognized Failure of Predictability in Newtonian Dynamics [and Discussion]," *Proceedings of the Royal Society of London. A. Mathematical and Physical Sciences*, vol. 407, pp. 35-50, 1986.

[16] R. M. May, "Simple mathematical models with very complicated dynamics," *Nature*, vol. 261, pp. 459-467, 1976.

[17] S. Iqbal, X. Zang, Y. Zhu, Y. Y. Chen, and J. Zhao, "On the impact of MOOCs on engineering education," presented at MOOC, Innovation and Technology in Education (MITE), 2014 IEEE International Conference on, India, 2014.

[18] K. Ingolfsdottir, "Impact of MOOCs and Other Forms of Online Education [Point of View]," *Proceedings of the IEEE*, vol. 102, pp. 1639-1643, 2014.

[19] D. H. Johnson, P. Prandoni, P. C. Pinto, and M. Vetterli, "Teaching signal processing online: A report from the trenches," presented at Acoustics, Speech and Signal Processing (ICASSP), 2013 IEEE International Conference on, 2013.

[20] S. A. Clemons, "Brain-based learning: Possible implications for online instruction," *International Journal of Instructional Technology and distance learning*, vol. 2, pp. 25-34, 2005.

[21] B. Means, Y. Toyama, R. Murphy, M. Bakia, and K. Jones, "Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies," *US Department of Education*, 2010.

[22] P. F. Mitros, K. K. Affidi, G. J. Sussman, C. J. Terman, J. K. White, L. Fischer, and A. Agarwal, "Teaching electronic circuits online: Lessons from MITx's 6.002 x on edX," presented at Circuits and Systems (ISCAS), 2013 IEEE International Symposium on, 2013.

[23] B. S. Bloom, "The 2 sigma problem: The search for methods of group instruction as effective as one-to-one tutoring," *Educational researcher*, pp. 4-16, 1984.

[24] E. Mazur, *Peer instruction: A User's Manual*: Prentice Hall, Inc. Upper Saddle River, New Jersey, 1997.

[25] R. Lapal, "President Obama Announces edX's Free Teacher Professional Development and Courses to Prepare for AP* Exams," 2014.

[26] J. Pope, "What Are MOOCs Good For?," MIT Technology Review, 2014.

[27] C. Kulkarni, K. P. Wei, H. Le, D. Chia, K. Papadopoulos, J. Cheng, D. Koller, and S. R. Klemmer, "Peer and self assessment in massive online classes," in *Design Thinking Research*: Springer, 2015, pp. 131-168.

[28] S. Sanchez Gordon and S. Lujan Mora, "MOOCs Gone Wild," in *Proceedings of INTED2014 Conference 10th-12th March 2014, Valencia, Spain*, 2014, pp. 1449-1458.

[29] A. D. Ho, J. Reich, S. O. Nesterko, D. T. Seaton, T. Mullaney, J. Waldo, and I. Chuang, "HarvardX and MITx: the first year of open online courses, fall 2012-summer 2013," *Ho, AD, Reich, J., Nesterko, S., Seaton, DT, Mullaney, T., Waldo, J., & Chuang, I.(2014). HarvardX and MITx: The first year of open online courses (HarvardX and MITx Working Paper No. 1)*, 2014.

[30] B. Obama, "Remarks by the President on College Affordability--Buffalo, NY. Washington, DC: The White House, Office of the Press Secretary," 2013.

[31] J. Billsberry, "MOOCs: Fad or revolution," *Journal of Management Education*, vol. 37, pp. 739-746, 2013.

[32] S. Kolowich, "Why professors at San Jose State won't use a Harvard professor's MOOC," *The Chronicle of Higher Education*, vol. 2, 2013.

[33] V. L. B. Dolan, "Massive online obsessive compulsion: What are they saying out there about the latest phenomenon in higher education?," *The International Review of Research in Open and Distributed Learning*, vol. 15, 2014.

[34] J. Daniel, "MOOCs: What lies beyond the trough of disillusionment," presented at LINC 2013 Conference, 2013.

[35] G. Anders, "Coursera hits 4 million students-and triples its funding," *Forbes. com*, 2013.

[36] D. Koller, "What MOOCs Teach Us," in *MIT Technology Review*, 2014.

[37] C. Sandeen, "Integrating MOOCS into traditional higher education: the emerging "MOOC 3.0" Era," *Change: The Magazine of Higher Learning*, vol. 45, pp. 34-39, 2013.

[38] "Antioch University Becomes First US Institution to Offer Credit for MOOC Learning Through Coursera," 2014.

[39] "Georgia Tech College of Computing. Online Master of Science in Computer Science," 2014.

[40] C. Christensen and M. Horn, "Colleges in crisis: Disruptive change comes to American higher education," *Harvard Magazine*, vol. 7, pp. 1-4, 2011.

[41] S. P. Marshall, "Chaos, complexity and flocking behavior: metaphors for learning," *Wingspread Journal*, vol. 18, pp. 13-15, 1996.

[42] J. W. Forrester, "Nonlinearity in high-order models of social systems," *European Journal of Operational Research*, vol. 30, pp. 104-109, 1987.

[43] M. Fahim and F. A. Talabari, "Chaos/Complexity Theory and Education," *Journal of English Language Teaching and Learning*, vol. 13, pp. 43-56, 2014.

[44] E. D. Macpherson, "Chaos in the curriculum: A rejoinder to Hunter and Benson," *Journal of curriculum studies*, vol. 29, pp. 101-104, 1997.

[45] S. Cvetek, "Applying chaos theory to lesson planning and delivery," *European Journal of Teacher Education*, vol. 31, pp. 247-256, 2008.

[46] V. Akmansoy and S. Kartal, "Chaos Theory and its Application to Education: Mehmet Akif Ersoy University Case," *Educational Sciences: Theory & Practice*, vol. 14, pp. 510-518, 2014.

[47] I. de Waard, "Explore a new learning frontier: MOOCs," *Learning Solutions Magazine*, 2011.

[48] W. J. Hunter and G. D. Benson, "Arrows in time: The misapplication of chaos theory education," *Journal of curriculum studies*, vol. 29, pp. 87-100, 1997.

[49] K. VanderVen, "Chaos/complexity theory, constructivism, interdisciplinarity and early childhood teacher education," *Journal of Early Childhood Teacher Education*, vol. 18, pp. 43-48, 1997.

[50] S. Iqbal, S. A. Qureshi, T. H. Rizvi, G. Abbas, and M. M. Gulzar, "Concept Building through Block Diagram Using Matlab/Simulink," *IEEEP Journal*, vol. 66-67, pp. 30-34, 2010.

[51] S. Iqbal, H. A. Sher, and S. A. Qureshi, "PSpice in Undergraduate and Graduate Electrical Engineering Courses," *IEEEP Journal*, vol. 57-58, pp. 18-20, 2007.

[52] J. P. de la Croix and M. Egerstedt, "Flipping the controls classroom around a MOOC," presented at American Control Conference (ACC), 2014, 2014.

[53] G. J. Kim, E. E. Patrick, R. Srivastava, and M. E. Law, "Perspective on Flipping Circuits I," *Education, IEEE Transactions on*, vol. 57, pp. 188-192, 2014.

[54] D. H. Johnson, "Teaching a "MOOC"; Experiences from the front line," presented at Digital Signal Processing and Signal Processing Education Meeting (DSP/SPE), 2013 IEEE, 2013.

[55] S. Iqbal, S. A. Qureshi, and M. Shafiq, "What is Chaos?," *IEP journal*, pp. 7-10, 2008.

[56] G. D. Catalano, "Chaos, Engineering, and Engineering Education," *Journal of Engineering Education*, vol. 85, pp. 11-14, 1996.

[57] S. Iqbal, M. Rafiq, S. Iqbal, M. O. Ahmed, and H. A. Sher, "Study of Nonlinear Dynamics Using Logistic Map," presented at LUMS 2nd International Conference on Mathematics and its Applications in Information Technology (LICM08), Lahore, March 10-12, 2008.

[58] S. Iqbal, M. Ahmed, and S. A. Qureshi, "Investigation of chaotic behavior in DC-DC converters," *World Academy of Science, Engineering and Technology*, vol. 33, pp. 291-294, 2007.

[59] S. Iqbal, K. A. Khan, and S. Iqbal, "Understanding Chaos using Discrete-Time Map for Buck Converter," presented at Chaotic Modeling and Simulation International Conference (Chaos 2010), 2010.

[60] S. Iqbal, X. Zang, Y. Zhu, and J. Zhao, "Study of Bifurcation and Chaos in DC-DC Boost Converter using Discrete-Time Map," presented at International Conference on Mechatronics and Control (ICMC'2014), China, 2014

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Editor's Note: Dr. Osuji has distilled the theory and practice of self-directed learning, and how it meshes with open and distance learning, into a dialog that is convincing, well documented, and easy to follow. His research provides relevant data for academics and administrators to show the importance of self-directed learning to the success of open and distance learning in Nigeria.

An assessment of self-directed learning effectiveness among open and distance learners in Nigeria.

Sir, U. S. A. Osuji
Nigeria

Abstract

The study looked at Self-Directed Learning (SDL) effectiveness among Open and Distance Learners (ODL) in Nigeria. 300 students were used as subjects. These consists of 100 students from each of three mega-study centres of Abuja, Benin and Lagos. A 19 item instrument called Self-directed Learning Effectiveness Questionnaire (SDLEQ) was developed for data collection. Three research questions and two hypotheses were proposed for verifications. Percentages and means were used for analysis to answer the research questions. These yielded means and aggregate means that are significant. The two hypotheses were tested using the t-test for independent means at p= 0.05. The null hypothesis were accepted. The results show that the learners are self-directed, and that SDL is effective in ODL in Nigeria. It was concluded that ODL institutions should provide enabling environments supported by technologies to encourage SDL among learners, considering the numerous benefits of SDL.

Keywords: self-directed learning, effectiveness, benefits, models, open and distance learning, self-directed learners

Introduction

Learning is a complex process which has given rise to different types of interpretations and theories. These focus on how to ensure that meaningful learning is achieved. It is not in doubt that the teaching and learning approaches based on the behaviourist theories are no longer required in this technological development age. This is because it is mainly a teacher centred approach to education, which has dominated much of education system and especially the higher education system. The shift in paradigm is towards the constructivist approach to teaching and learning. This according to Varga (2010), is based on humanistic philosophy. This is because, according to Gibbons (2014), we are no longer thinking of learning as something that occurs in an educational institution under the direction of a teacher within the structure of a course, based on textbooks and evaluated by a written examination. It means that for one to become an expert, he is expected to attend such institution until some certification of expertise is granted. This is a very narrow view of learning and education. It is a narrow perception of the development of expertise. Human beings learn formally as well as informally. Gibbons (2014), affirms that skills that the individual acquires through informal, self-directed learning may in the long run of lifetime be the more important of the two.

It is a well-known fact that everybody spends much more time out of school than inside the school. Of a truth, at the end of schooling, one still has many more years of life ahead. During these years learning continues. This is why Balley (2014) pointed out that continued growth during these out-of-school hours, months and years requires continued learning. This involves learning to master new jobs, to become better lovers, to meet life crises, to find new interests, to handle changes in society, to master new roles, to make contributions worthy of ones capabilities, to open up new dimensions in one's life and relationships. This growth, which is based on informal learning, is quite different from formal education. It mean self-education. According to

Gibbons (2014), for you to be self-educated means you must be independent, energetic, creative and strongly self-directed. Most people have these characteristics. But our educational institutions encourage them to be dependent, passive, confirming and generally willing to be directed. It means that we should find a way of helping students of all ages to become skillfully self-directed. This must be made a part not only of schooling, but of all forms of education. This should include the education which parents give to their children and the education which everybody gets throughout life. It means that everybody needs self-education. This is what makes Open and Distance Learning popular and interesting. A body of theories and opinions on self-directed learning (SDL) or subjects closely related to it, has been noted. For instance, Rogers (1969 and 1977), Maslow (1954) and Peris, Hofferline and Goodman (1951) theorized that self-education or SDL helps students or parents to gain control of their lives by helping them to make their own decisions, to actualize their own potentials and to convert their inner conflicts into inner dialogues in order to resolve them. Psychologists like Bradford, Gibb and Benne (2014), Harris (2013) and Schmuck, Runkel, Satunen, Martell and Derr (2014) are in agreement with the theories and confirm that it helps students learn about themselves through different forms of group processes, the self-directed training group, the transactional group that learns to analyze and modify the transactions their members have within each other and the group method of management that enables organization to be productive while cultivating individual growth. Schutz (2007) described SDL as a way of increasing one's personal awareness and responsiveness by becoming more sensitive to the inner life, the world around him and that of other people. It is also interesting to note that a number of writers have developed arguments and techniques for SDL as a way of personalizing education and teaching people how to teach themselves. For instance, Brown (1974) described SDL or self-education as a way to make academic a personal experience. Tough (1971 and 1978) in a study found out that nearly all adults make use of ambitious SDL projects every year. While Faure (1972) emphasized that education must combine practical experience with academic studies, it must do this in a way that promotes self-education and prepares people for life-long learning.

Developments in both humanistic and behavioural psychology give potential contributions to SDL theory. Hill (1978), in his report, 'Internality: an educational imperative', has traced the relationship between an internal locus of control over events and desirable traits of personal educational and social behaviour. Benson (1975) and Naranjo (1971) demonstrated the broad spectrum of beneficial effects that accompany deep relaxation and meditation, pointing to the potential usefulness of the discipline of the mind to self-education. Other humanistic theorists like Watson and Tharp (1972), Brown (1974) and Mahoney and Thoreson (1974) describe SDL as a way of teaching people to plan their own programmes of action, feedback and reinforcement. No doubt, each of these bodies of literature and studies brings out some issues and ideas about the importance of SDL. It should be noted that they have not been integrated into a coherent theory or practice for a form of education that can teach people to pursue excellence voluntarily in a productive field of human activity.

According to Rodems (2011), SDL theory is based upon several fundamental concepts. These are:

All individual have the capacity to engage in and develop SDL skills.

Learners can and should take greater control over the learning experience.

SDL habits are transferable from one activity to another.

It means that the role of the teacher is to assist the students develop self-directed learning skills by providing directions and support based on the need of the students and the activities involved. This study therefore seeks to find out how effective the SDL in ODL is in the Nigerian situation and what makes it effective or ineffective.

Self-directed learning as a concept

Knowles (1972) described SDL in its broadest meaning as a process by which individuals take the initiative, with or without the assistance of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes. Tough (1978) described SDL as learning efforts, self-planned learning. Zimmerman (1990) described it as a self-regulated learning.

The concept of SDL first appeared as a viable concept in the 1970s. It has its roots in adult education. There may be slight variations in the way different scholars define SDL, but literature on the subject identifies several tenets which are central to the concept. For instance, Bolhuis (1996) and Garrison (1997) say that SDL views learners as responsible owners and managers of their own learning process. It integrates self-management, i.e. management of the context, including the social setting, resources and actions, with self-monitoring which is the process whereby the learners monitor, evaluate and regulate their cognitive learning strategies. Corno (1992) and Garrison (1997) recorded that SDL recognizes the significant role of motivation and volition in initiating and maintaining learners' efforts. Motivation drives the decision to participate and volition sustains the will to see a task through to the end so that goals are achieved. Lyman (1997) and Morrow, Sharky and Firestone (1993) note that in SDL, control gradually shifts from the teacher to the learner. Learners exercise a great deal of independence in setting learning goals and deciding what is worthwhile learning as well as how to approach the learning task within a given framework. In their own opinion, Gurthrie, Alao and Rinehart (1997), and Temple and Rodero (1995) agree that SDL is, ironically highly collaborative. This is because learners collaborate with teachers and peers. SDL develops domain-specific knowledge as well as the ability to transfer conceptual knowledge to new situations. It seeks to bridge the gap between school knowledge and real-world problems by considering how people learn in real life (Bolhuis, 1996, Temple and Rodero, 1995). From all this evidence from literature, it is quite obvious that SDL has many benefits, especially for Open and Distance Learners and for adult learners in general.

Benefits of self-directed learning

Most people who have made a switch to SDL agree that it is more than just a new approach to education. It is a new way of living. The reason is that SDL reflects a belief that learners have a right to live their own lives and follow their own paths to pursue happiness in their own ways, as long as they do not interfere with the rights of others to do the same. This is all about democratization of education which is the hallmark of ODL. This is why Gureckis and Markant (2012) reported that SDL speaks to the creation of a collaborative culture, one in which individual liberties are valued and exercised in synergistic ways that support liberty and justice for all. This is based on the assumption that it is a win-win philosophy. Gureckis and Markant (2012) listed some of the benefits as follows:

> SDL promotes the natural development of self-confidence, initiative, perseverance and life satisfaction. It enables people to be in charge of their own lives. Human beings are responsible for making such choices that help them to create their own paths once they become of age; SDL greatly increases a person's ability to make sound, intelligent, self-affirmation choices when the stakes are high. The more practice young people have in making their own decisions - with reading their own ideas, feelings, wants and needs, and weighing these decisions against available options, the more likely they are to grow into mature, sensible, healthy, productive and compassionate adults.
>
> SDL decreases the probability that children will suffer from the life-long wounds commonly produced by coercive schooling. This means that many people will not experience systematic

reinforcement of the negative messages like calling them incompetent or stupid, unmotivated or lazy, because they failed and were not promoted to the next class at the same time with the others.

SDL provides opportunities to pursue a far wider range of interests than is possible in a typical school. The school has pre-defined curriculum, fixed schedules and inability to accommodate the needs and interests of individuals. In SDL, even the topics within the usual school curriculum can be explored in greater depth and with greater meaning.

SDL reinforces collaboration, within and beyond the family. Without the imposed requirements of school curriculum, parents and learners have the opportunity to create, discuss, negotiate, design, explore and do what they have decided that will best serve their goals, values and personal desires and interests.

According to Kretzschmar (2014), the benefits of SDL are best described in terms of the type of learners it develops. Garrison (1997) confirms that literature on SDL asserts that self-directed learners demonstrate a greater awareness of their responsibility to make learning meaningful and monitoring themselves. Self-directed learners are always curious and willing to try new things (Lyman, 1997). In his own contribution, Taylor (1995) says that self-directed learners view problems as challenges which desire changes and therefore enjoy their learning. Taylor (1995) also found them to be motivated and persistent, independent, self-disciplined, self-confident and goal oriented. SDL allows learners to be more effective learners and social beings. They demonstrate the ability to search for information in multiple or different texts. They employ different strategies to achieve goals and to present ideas in different forms such as drawing and writing. Kretzschmar (2014) observed, therefore, that with proper planning and implementation, SDL can encourage students to develop their own rules and leadership patterns. This should be the focus of open and distance learners.

In her own contribution, Addante (2014) described the benefits of SDL for corporate bodies as

Business cannot meet all the training needs of their employees.

SDL is less costly than traditional training.

It enables learners to learn only what they need to learn.

It makes learning a truly sustainable enterprise with efforts.

It is relevant for everyone.

Actions and models that promote SDL

SDL is undoubtedly becoming the core of any sort of learning for both near and future. On the basis of this, it has become necessary to suggest or develop actions and models that support these learners in finding, analyzing, improving, repackaging and sharing data in pursuit of self-knowledge. Heick (2014) proposed some cognitive actions which can promote self-directed learning as follows:

Challenge something

Make an observation

Draw a conclusion

Question something

Revise a question based on observation and data

Critique something

Explain the significance of something

Revise something

Improve a design

Transfer a lesson or a philosophical stance from one situation to another.

Identify a cause and effects.

Test the validity of a model

Compare and contrast two or more things

Separate causes from symptoms

Identify the primary and secondary causes of a problem

Adapt something for a new need or circumstance

Make a prediction and observe what occurs

Narrate a sequence

Study and visually demonstrate nuance

Identify and explain a pattern

Study the relationship between text and subtext

Elegantly emphasize nuance

Critically evaluate a socially-accepted idea

Extract a lesson from nature

Take and defend a position

Record notes during and after observation of something.

On the models that promote SDL, Tough (1971 and Knowles (1970) proposed three types of models. These are:

1. **Linear model**: in this model the assumptions are that the learners passed through series of tasks and steps to achieve their learning goals. These are deliberately planned from beginning to the end by the learner.
2. **Interactive model**: here learners engage in SDL based on what is available in the environment where they live. These include their personality characteristics, cognitive processes and learning context among others.
3. **Instructional model**: Usually found in formal education - related to the goals of SDL.

For the avoidance of doubt, Tough (1978) listed the goals of SDL as follows:

To enhance the ability of adult learners to be self-directed in their learning.

To promote transformational learning as key to SDL and

To promote emancipator learning and social action as an integral part of SDL.

In his model of how teachers can promote SDL, Grow, cited in Stokes (2014) gives four stages:

i. Dependent learner, who depend wholly on their teachers.
ii. Interested learners, who are motivated but not informed about the subject matter.
iii. Involved learners, who are more knowledgeable about the subject matter but are ready to explore with help.
iv. Self-directed learners, who plan execute and evaluate their own learning with or without help.

For the purpose of this study, the fourth stage which is on SDL is the focus. The question is to find out if the learners of ODL in Nigeria are self-directed. If yes, what factors make the SDL in the ODL in Nigeria effective?

Purpose of the study

To find out whether open and distance learners in Nigeria are self-directed.

To find out if SDL is effective in ODL in Nigeria.

To find out what makes SDL effective or not effective in the ODL system in Nigeria.

Research questions

Are open and distance learners in Nigeria self-directed?

Is SDL effective in the ODL system in Nigeria?

What factors make SDL effective or not effective in Nigeria?

Research hypotheses

Ho1. There is no significant difference between male and female learners' perception of SDL in Nigeria.

Ho2. There is no significant difference between undergraduate and post graduate learners' perception of SDL in Nigeria.

Methodology.

Design of the study

Descriptive survey design is used for the study. Data were collected from ODL students from the only single-mode university, National Open University of Nigera (NOUN)

Area of study

The study is restricted to only learners selected from the ODL system in Nigeria.

Population and samples

The population of the study consists of all the learners in the ODL system in Nigeria. It is not possible to reach all the learners from the 62 study centres of NOUN at the same time. The three most populous and mega centres of NOUN were used, these are Ikeja-Lagos, Benin and Abuja Central Area study centres. Again, due to the fact that the population of learners in each of these centres is more than 20 thousands, it is not possible to have a randomized sample. Therefore, availability sampling was used to select 100 learners from each of the three centres. Thus a total of 300 learners were used as subjects and responded to the questionnaire.

Table 1

Distribution of learners from the three mega centres of NOUN.

Study centre	U.G	P.G	Total		Male	Female	Total
Abuja	60	40	100		56	44	100
Benin	65	35	100		52	48	100
Lagos	64	36	100		58	42	100

Instrumentation

The instrument used for data collection, called Self-Directed Learning Effectiveness Questionnaire (SDLEQ), was developed by the researcher. It was subjected to expert validation, using two experts in Measurement and Evaluation and one senior lecturer in Psychology. Corrections and suggestions from these experts were incorporated in the instrument, which was then subjected to test-retest reliability test, using learners from McCarthy and Apapa study centres, all in Lagos. The reliability coefficient using Pearson product moment correlation is 0.68.

Data collection

The instrument SDLEQ was administered to the learners using the student counselors and administrative officers of the three study centres of NOUN used in the study.

Results

Research Question 1. Are open and distance learners in Nigeria self-directed?

Table 2

The number, percentage and mean responses for research question 1

SN	Item	SA=4	A=3	D=2	SD=1	Mean
1	I consider myself a self-directed learner.	161, 53.7%	118, 39.3%	11, 3.7%	10, 3.3%	3.97
2	I study on my own most of the time.	158, 52.7%	124, 41.3%	12, 4.0%	06, 2.0%	3.45
3	I plan and manage my time for my studies.	162, 54.0%	120, 40.0%	15, 5.0%	03, 1.0%	3.14
4	I usually set targets for my independent studies.	155, 51.7%	131, 43.7%	10, 3.3%	04, 1.3%	3.46
5	I am internally motivated to study on my own.	170, 56.7%	114, 38.0%	09, 3.0%	07, 2.3%	3.49
6	I usually assess my studies at intervals.	131, 43.7%	147, 49.0%	10, 3.3%	12, 4.0%	3.72
	Aggregate mean					3.54

Table 2. shows the number, percentage and mean of responses made by the subjects in relation to research question one. The mean for all the items are above 3.00. This indicates that the mean responses are significant. Again the aggregate mean which is 3.54 is above the significant level. These imply that Open and Distance Learners in Nigeria are self-directed learners.

Table 3

The number, percentage and mean responses for research question 2.

SN	Item	SA=4	A=3	D=2	SD=1	Total
7	SDL is effective in NOUN	140 46.7%	135 45.05	14 4.7%	11 3.7%	3.35
8	I study for career advancement	125 41.7%	122 40.7%	28 9.3%	25 8.3%	3.16
9	I study for professional development	131 43.7%	126 42.0%	20 6.7%	23 7.7%	3.22
10	I cannot afford to attend a conventional university	106 35.3%	115 38.3%	63 21.0%	16 5.3%	3.04
11	I cannot combine work and family with conventional education	114 38.0%	119 39.7%	47 15.7%	20 6.7%	3.09
12	I contact my peers and teachers from time to time.	148 49.3%	102 34.0%	36 12,0%	14 4.7%	3.28
	Aggregate Mean					3.19

A look at table 3 above shows that the means for all the items in this section are above the significant level of 2.50. The aggregate mean of 3.19 is also significant. The implication is that SDL is effective in the ODL system in Nigeria.

Table 4

The number, percentage and mean responses for research question 3

SN	Item	SA=4	S =3	D =2	SD=1	Mean
13	I use mobile phones to interact with my peers and teachers.	180 60.0%	81 27.0%	19 6.3%	20 6.7%	3.40
14	I use e-mail to communicate with my peers and teachers.	114 38.0%	105 35.0%	68 22.7%	13 4.3%	3.07
15	I use the social media to chat with my peers and teachers.	96 32.0%	104 34.7%	84 28.0%	16 5.3%	2.93
16	I use the internet (i-learn) platform to discuss and have forum with my peers and teachers.	156 52.0%	122 40.7%	12 4.0%	10 3.3%	3.38
17	I download my course materials from the web.	167 55.7%	121 40.3%	10 3.3%	02 0.7%	3.51
18	I register my courses online	201 67.0%	80 26.7%	09 3.0%	10 3.3%	3.57
19	I check my results online.	142 47.3%	105 35.0%	28 9.3%	25 8.3%	3.21
	Aggregate mean					3.30

The number, percentage and the means of the responses for all the items in this section follow the same pattern as the previous tables. The mean responses for all the items are above the significant level. The aggregate mean value of 3.30 is also significant. This shows that mobile phones, e-mails, social media, internet and the use of computers in ODL help to make SDL effective.

Ho 1. There is no significant difference between male and female learners' perception of SDL in Nigeria.

Table 5

t-test of significance for Ho 1.

Gender	Mean	SD	NO.	df	t-cal.	t-tab.	P	Decision
Male	55.31	9.82	166					Accept Ho.
Female	54.49	3.23	134	298	1.01	1.96	0.05	

From table 5 above, we observe that the t on the table (1.96) is greater than the calculated t value of 1.01 at p = 0.05, when the degree of freedom is 298. With this result, the null hypothesis is accepted. It implies that there is no significant difference in the way both the male and their female counterparts perceive SDL in the ODL system in Nigeria.

Ho 2. There is no significant difference between undergraduate and post graduate learners' perception of SDL in Nigeria.

Table 6
t-test of significance for Ho 2.

Level	Mean	SD	No	df	t-cal	t-tab	P	Decision
Under G	54.68	51.76	189					Accept Ho
Post G	54.88	9.06	111	298	0.05	1.96	0.05	

Table 6 above shows that with the degree of freedom of 298 and P = 0.05, the calculated t of 0.05 is less than the t-on the table, which 1.96. The decision therefore is to accept that there is no significant difference between the undergraduate and post graduate learners' perception of SDL in Nigeria.

Discussion

From the result of this study, it is interesting to note that the learners of ODL in Nigeria are self-directed learners. It shows that they have most of the attributes of self-directed learners. This is in line with Gibbons' (2014) position that a self-directed learner must be independent, energetic, creative and strongly self-directed. It has also supported the Rodem' (2011) theory that all individuals have the capacity to engage in and develop SDL skills, and that learners can and should take greater control over their learning experience.

According to the results, SDL is effective in Nigeria. This is because most of these learners go into ODL for many reasons. These include career advancement or professional development, and the fact that they cannot leave their jobs to study in the conventional system. This is why Kretzschmar (2014), Bolhuise(1996) and Garrison (1997) agree that self-directed learners are responsible owners of their own learning process by integrating self-management with self-monitoring. In this context self-management includes management of the context, including social setting, resources and actions, while self-monitoring involves the process whereby the learners monitor, evaluate and regulate their cognitive learning strategies. This result also corroborates those of Varga (2010) and stokes (2014) that people engage in SDL for such reasons as time management, family obligations, cost of traditional learning, preference, etc.

Learners in the ODL system in Nigeria are motivated to have SDL because of the two-way communication or interaction provided by the emergence of information and communication technologies. These have removed the physical distance between the learner and the teacher or the ODL institution. This is because they can do most of their academic activities online using their computers or mobile electronic devices available to them. This is very much in line with Knowles (1972) descriptions of SDL when he reported that learners take the initiatives with or without the assistance of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes. These resources include the technologies which help them to achieve their goals of joining ODL.

Tables 5 and 6 show that the two null hypotheses tested were accepted. Thus indicating a no significant difference between male and female learners, and between post graduate and undergraduate learners in their perception of SDL in Nigeria. This result has confirmed the report of Heick (2014), which says that the goal of ODL is to create a SDL model that supports 21st century learners irrespective of gender or their level of higher education, in finding, analyzing, improving, repackaging and sharing data in pursuit of self-knowledge. This also goes to show that both gender and level of higher education do not play significant role in the SDL indices.

Conclusion

Research reports have shown that students are better able to learn when they can have control over their experiences in learning or when their learning is self-directed. The benefits of SDL are widely acknowledged. SDL is effective because it makes the students more willing and more motivated to learn. It helps them to optimize their educational experiences, allowing them to focus their learning efforts on useful information which they do not have already, thereby exposing them to information which they do not have access to. Therefore, the active nature of SDL helps the students to encode information and retain it over time. The ODL institutions should then play the role of providing the necessary environmental and technological support to encourage these students in their SDL. More students should be carried out on SDL, especially in the area of its influence on the cognitive processes and academic achievement.

References

Addante, S. (2014), Why do client always want to short change learning? Chicago, Sheffield Marketing ltd.

Balley, A. (2014), Learning without boundaries. The Journal of Humanistic Psychology. Spring. P.41-56.

Benson, H. (1975), Relaxation response. New York; Morrow.

Bolhuis, S. (1996), Towards active and self-directed learning. Preparing for lifelong-learning, With reference to Dutch secondary education. Paper presented at the annual meeting of The American Educational Research Association. New York NY. April, 8-12.

Bradford, L. P., Gibb, J.R. and Benne, K. D. (2014), T-group theory and laboratory method: Innovation in re-education. New York, John Wiley.

Brown, B. (1974), New mind, new body: Bio feedback: New directions for the mind. New York. Harper Row.

Brown, G. I. (1971), Human teaching for human learning. New York, Viking Press.

Corno, L. (1992), Encouraging students to take responsibility for learning and performance. Elementary School Journal, vol. 93 No. 1 p. 69-83.

Faure, E. (1972), Learning to be. The world of education today and tomorrow. Paris, UNESCO.

Garrison, D. R. (1997), Self-directed learning: Towards a comprehensive model. Adult Education Quarterly. Vol. 48 No. 1p. 16-18.

Gibbons, M. (2014) Towards a theory of SDL: A study of experts without formal training. Chicago, Personal Power Press International.

Gureckis, T. and Markant, D. (2012), What makes self-directed learning effective? Perspectives on Psychological Sciences. Vol 62 No 2, p. 4-16.

Gutherie, J. T, Alao, R, and Rinehart, J. M. (1997), Growth of literacy engagement: Changes in Motivations and strategies during concept-oriented reading instruction. Reading Research Quarterly. Vol. 31, No 3, p. 306-312.

Harris, T. A, (2013), I'm ok. You're ok: a practical guide to transactional analysis. New York, Avon.

Heick, T. (2014), Cognitive actions that promote self-directed learning. Journal of Adolescent and Adult Literacy, Vol. 45 No. 4, p. 438-446.

Hill, R. (1978), Internality; an educational imperative. Journal of Humanistic Psychology, 18(3), p. 43—57.

Knowles, M. S. (1970), The modern practice of adult education, from pedagogy to andragogy Revised and updated. Retrieved from http:/74.125.155.132/scholar?

Knowles, M. S. (1972), Principles of andragogy. Chicago, Sheffield marketing ltd.

Kretzschmar, M. (2014), Self-directed learning. Home schooling guide for San Antonio Area. San Antonio, Home education.

Lyman (1997), cited in Kretzschmar, M. (2014), Self-directed learning. Home schooling guide for San Antonio Area. San Antonio, Home education.

Mahoney, M. J. and Thoresen, C.E. (1974), Self-control: Power to the person. Belmont Calif. Brooks Cole.

Maslow, A. H. (1954), Motivation and personality. New York. Harper.

Morrow, L.M, Sharky, E. and Firestone, H. (1993), Promoting independent reading and writing through self-directed literacy activities in a collaborative setting. Reading Research Report, No 2. P 356-365.

Naranjo, S. B. (1971), Andragogy and self-directed learning, pillars of adult learning theory: New Directions for Adult and Continuing Education. Vol.89 p. 3-13.

Peris, Hofferline and Goodman (1951), cited in Harris, T. A, (2013), I'm ok. You're ok: a practical guide to transactional analysis. New York, Avon.

Rodems, E. (2011), Teaching self-directed learning to learners at all stages of development. Maryland, pharm. D. PGY1

Rogers, (1969& 1977), cited in Rodems, E. (2011), Teaching self-directed learning to learners at all stages of development. Maryland, pharm. D. PGY1.

Schmuck, Runkel, Satunen, Martell & Derr. (2012), cited in Kretzschmar, M.(2014), Self-directed learning. Home schooling guide for San Antonio Area. San Antonio, Home education.

Schutz, (2007), cited in Rodems, E. (2011), Teaching self-directed learning to learners at all stages of development. Maryland, pharm. D. PGY1.

Stokes, B. (2014), Theories of teaching and learning: staged self-directed learning mode. San Antonio, G.G Ltd.

Taylor, B. (1995), Self-directed learning: Revisiting an idea most appropriate for middle school students. Paper presented at the combined meeting of the Great Lakes and Southeast International Reading Association, Nashville, TN, Nov 11-15.

Temple, C. and Rodero, M. L. (1995), Active learning in a democratic classroom: -The "pedagogical invariants" of Celestin Freinet (reading around the World). Reading Teacher; vol. 49 No. 2 p.164-167.

Tough, A. (1978), Major learning efforts: recent research and future directions. Adult Education Quarterly, 28(4), 250-263.

Tough, A. (1971), cited in Tough, A. (1978), Major learning efforts: recent research and future directions. Adult Education Quarterly, 28(4), 250-263.

Varga, N. (2010), Self-directed learning theory. Bloomington, Eric ltd.

Watson and Tharp (1972), cited in Tough, A. (1978), Major learning efforts: recent research and future directions. Adult Education Quarterly, 28(4), 250-263.

Zimmerman, (1990), cited in Temple, C. and Rodero, M. L. (1995), Active learning in a democratic classroom: The "pedagogical invariants" of Celestin Freinet (reading around the World). Reading Teacher; vol. 49 No. 2 p.164-167.

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Editor's Note: There are many different ways to learn – inductive or deductive, step-by-step or gestalt, formal or informal, active or passive, individual or collaborative, associative (operant conditioning) or non-associative (habituation), rote-learning or meaningful learning, constructivist teaching, learning-by-doing, games and simulations, abstract or concrete, and scientific method (observation, measurement, experiment and the formulation, testing and modification of hypotheses). Effectiveness may be impacted by relevance, learner motivation, engagement, learning environments, media and social settings. In basic research we test elements individually and in combination under controlled conditions. This paper is basic research.

The effect of difference of skills display sequence in virtual classroom programs on cognitive achievement and programming skills for first-year secondary school students

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Abstract

The goal of this study is to identify the effect of different skill display sequences in the virtual classrooms programs on cognitive achievement and programming skills for the first-year secondary school students. It compares whole-partial display and partial-whole display to determine the appropriate method of skills display in virtual classrooms programs. In order to achieve the objectives of this study, it uses descriptive as well as quasi-experimental approaches.

A performance score card and achievement test were designed to teach programming skills using Visual Basic Studio in virtual classes. The achievement test and performance score cards were applied to 60 students in two equal sub-groups:

Members of the first sample sub-group learn from a whole-partial skills display. Members of the second sample sub-group learn from a partial-whole skills display

The study found no significant difference at the (0.05) level between average marks obtained by students in the first sample sub-group and average marks obtained by students in the second sample sub-group.

Differences were significant at the 0.05 level between average marks on the performance score card obtained by students in the first sample sub-group and average marks obtained by students in the second sample sub-group. Results favored the second sample sub-group (partial-whole skills display).

Keywords: skills display sequence, virtual classrooms, programming skills.

Introduction

The tremendous development of communication and teaching technologies led to development of e-learning, which is the solution to a number of educational problems: increasing numbers of students to be served, shortage of classrooms, travel distance for students, and media to supplement live teaching to help learners to improve their skills in various fields of science. As a result, on campus classes are now supported by distance learning and virtual classrooms.

e-Learning is the process of learning or accessing information through multimedia technologies. The student is no longer isolated by time and distance circumstances. The professors and learners are connected by the internet, intranet, extranet or interactive television. The process of learning can occur any-time and any-where according to learner needs. The management of learning becomes the learners' responsibility. (Ali et al, 2009)

Virtual classrooms are considered a form of distance education, an interactive teaching strategy that effectively combines both characteristics of individual learning and distance learning as in a traditional classroom, where the student joins the virtual classroom to start learning under the guidance of the teacher. (Alaqbilat, 2005)

The study of (El-Mubarak, 2005) refers to the effect of teaching through the internet, via virtual classrooms, on achievement of teachers-in-training in learning communication techniques at King Saud University. Virtual classroom technologies are beneficial in solving a variety of educational problems: students in danger of dropping out, those who consider themselves too old to attend a university; the education of women; lack of teaching staff; or access to expertise from other regions of the world. Using virtual classrooms can lead to increasing educational achievement and help professors to connect and exchange experiences with learners. (Khalif, 2009)

The study of (Zein El-Din, 2007) showed that reliance on virtual classrooms system began after achieving good results on the global level, and the emergence of its positive impact in supporting the educational system and raising its efficiency. He defined some important characteristics as follows: convenient and flexible scheduling of study times; immediate access to the latest modifications to the program; achieving the principle of continuous education; low costs; no travel time; and technologies for interaction between student and teacher.

The study of (Loureiro, Bettencourt, 2011) determined that virtual learning environments allow students to participate and interact more and helps to enrich the educational content. Crisan and Enache (2012) indicate that the advantage of the virtual classroom is to transform the role of the teacher from the only supplier of information to an instructor or guide who gives students access to a broad range of learning resources.

The study of (Subramaniam, Kandasamy, 2011) noted that, to make the virtual classrooms more effective, we should design the virtual classroom, learning materials, evaluation process and methods of teaching based on contemporary educational theories and best practices. The study of (El-baghdady, 2011) refers to the importance of efficiencies in design and development that include defining electronic interactive methods to link learners to other learners, learners to teachers and subject matter, and benefit from efficiencies of electronic communications.

Many countries have adopted virtual classrooms for learning some educational subjects. After the education ministry of New Zealand used virtual classrooms to teach some of their curriculum, in 2008, it made a contract with one of the research centers to research about the effect of using the virtual classrooms at the secondary schools oft New Zealand, especially in country regions, far places and small schools, to overcome the problems of distance and provide resources to extend the range and quality of school curriculums that they give their students through virtual classrooms. (Bolstad, Lin, 2009) Their studies affirmed the importance of displaying skills in e-learning programs. Samrah (2005) underlined the necessity of demonstrating the most successful skills inside those programs.

The study of (Atia, 2008) referred to the display style sequence skill in educational computer programs that could be enjoyed by learning the skill and mastering it.

The study of (Samrah, 2006) provided that the partial display style had a big effect at the realistic performance that is connected with skills in preparing and using the video camera. On the other hand, the study of (Mahdy, 2005) referred to the fact that computer displays were effective in learning freestyle swimming and back swimming.

This research study is an attempt to determine the effect of display style sequence inside virtual classroom programs and how it affects both the cognitive and skill aspects at the first-year secondary school students' programming unit of visual basic.

Research problem

Virtual classrooms employ web applications as e-learning tools to connect the professor and learner. To make the best use of these tools, the teachers must use virtual classrooms in the best way so learners can get the theoretical knowledge and practical skills they need.

To acquire such theoretical knowledge and practical skills through virtual classrooms, it is important to search out the best display style and sequence and present the skill in the most complete and successful way regarding its performance. This could be a complete-partial sequence display that teaches the skill through dividing it into parts where each one can be learned alone, which is called partial-full display style.

In previous studies that discussed virtual classrooms, they rarely display the style sequence skill ln the virtual classroom in detail, so we can define the research's problem with the question:

> What is the effect of the difference of display style sequence skill in virtual classrooms programs on the first-year secondary school students' cognitive achievement and programming skills?

Research questions

This research tries to answer the following basic question:

> What is the effect of difference of skills display sequence (full display followed by partial display or partial display followed by full display) in the virtual classrooms programs on cognitive achievement and programming skills for the first-year secondary school students?

And this request has the following sub-questions:

> What is the effect of difference of skills display sequence (full display followed by partial display or partial display followed by full display) in the virtual classrooms programs on *cognitive achievement* for the first-year secondary school students?
>
> What is the effect of difference of skills display sequence (full display followed by partial display or partial display followed by full display) in the virtual classrooms programs on *programming skills* for the first-year secondary school students

Importance of this research

The importance of this research comes from:

> Many researches and studies discussed the effect of the virtual classrooms on the educational process without discussing the display style or sequence skill inside these classes in detail. This research studies the display style sequence in virtual classroom programs.
>
> This research could provide data to guide instructional designers and computer teachers to choose a suitable display style to present a specific skill in a virtual classroom.

This study is a response to the global conferences recommendations that underlined activation of E-learning environments (The E-learning and distance learning second global conference; Samrah, 2005; Atia, 2008;El-mahdy, 2005).

The research limits

Objective Limits: the research is limited to only the content of one unit of computer curriculum (programming with Visual Basic language) First year of secondary school - edition of 1434 H.C.

> Time Limits: First semester: 1434-1435 school year.
>
> Place Limits: Ibn Manzour secondary school - Jeddah.

Research hypotheses

There is no statistically significant difference at the level of (0.05) between the average of the scores of students in post achievement cognitive test at the first experimental group and the second experimental group

There is no statistically significant difference at the level of (0.05) between the average of the scores of students at the performance of the students at observation skill card at the first experimental group and the second experimental group

Research group

The research group consists of (60) students of the first grade of secondary school from Ibn Manzour secondary school at Jeddah. This sample will be randomly divided into 2 experimental groups of (30) students. The first group will use full display method and the second group will use the partial display method.

Research methods

This research uses two methods:

Analytical descriptive method: to describe and analyze virtual classrooms, their style of display, their ways of designing, preparing research tools and theoretical framework of the research center.

Semi experimental method: to indicate the effect of the independent variable (display style "full - partial") on the following variables:

Cognitive aspects of programming skills using visual basic language.

Skill aspects of programming skills using visual basic language.

Method for research design

According to independent variable and its levels, the experimental design for this research will be as follows. Table 1 indicates the experimental design:

Table 1
Experimental design

Display Style / Programming Skills using visual basic language	Full->partial	Partial->full
Cognitive aspects	Group 1	Group2
Skill aspects	Group1	Group2

Research variables

This research includes the following variables:

Firstly, the independent variables: skills display sequence in the virtual classrooms programs:

Full-partial display.

Partial-full display.

Secondly, the following variables in results:

Cognitive achievement for programming by visual basic skills.

Skills side for programming by visual basic skills.

The research terms

Display style sequence skill: it is defined here as the way by which a part of the skill will be shown to the learner every time till the learner connect all the parts together, or the way by which the full skill will be introduced for the learner every time.

Visual classroom: It is a synchronous virtual environment which is managed by the teacher and allows direct interaction between the teacher and learners using the available class tools like chatting, video calls, raising hands, clapping, laughing, answering questions and also the possibility of immediate evaluating and displaying results to the class. (Heshmat,2008,30)

Programming in Visual BASIC NET: The visual basic programming language is known as programming technology that contain object oriented programming terms. This language is considered the main base improvement and modern programming. This language makes it easy for the programmer to prepare web applications. (Azab,2007,36)

The research theoretical frame work

Virtual classrooms concept

Virtual classrooms are considered classes like traditional classes which combine teacher, learner and educational content. They differ from traditional classes in time and place elements. They don't meet at a specific time or place and learners can access the educational content at any time and from any place. There is no agreement on a comprehensive and specific structure for virtual classes. Each researcher defined them from his point of view and according to how he uses them, which led to the emergence of many definitions for virtual classrooms.

Virtual classrooms are defined by software systems that work through an internet or intranet educational environment. They consist of a set of subsystems that are integrated in order to simulate the synchronous interactions and activities that take place within in traditional classrooms. The teacher manages the learning resources and allows students to participate in managing them with the possibility of recording or retrieving them again. (Moustafa, 2012)

Virtual classrooms are defined as a set of tools that include broadcasting videos, voice interacting, chatting, electronic discussion board and educational management that enables direct, interactive presentations similar to traditional teaching. (El-sayed, 2004)

Virtual classrooms can be defined as environments existing on the internet that include a set of tools that help the learner to access and interact with educational materials. They are also considered to be one of the e-learning tools. (Krogstie, Bygstad, 2005)

Synchronous virtual classrooms

They are similar to traditional classrooms, in which the teacher, learner, learner, tools and programs are together at the same time in different locations. (El-Mobarak, 1425,60)

Talk, video and audio between professor and students, giving students the opportunity to raise the hands

In addition to live and media presentations by professor and students, it is possible to communicate interactively using webcams and microphones when available.

Audio and video experiences that take place in the classroom can be recorded for all to use.

The class can be divided in to discussion groups; several discussion groups can be active simultaneously.

There is a box for text discussion.

An interactive whiteboard is available for group activities.

Surveys, pols, and test questions can be presented, including short answer, multiple choice or true or false. Composite results can be displayed directly to the students.

Students and teachers can share screens from slides and videos, computer applications, web cams, and the Internet.

The teacher can send files to all students.

Students can submit files of their assignments and projects to the teacher.

The teacher can control or manage entry and exit of students from the classroom.

These multiple possibilities for Synchronous virtual education are still in limited use, especially in Arab countries. The reason for the lack of communication to the global network of information is that the technology of the virtual classroom requires that the teachers should have devices and computers with high-specifications in addition to high-speed connections so that students can participate in sharing data with teachers.

Components of virtual classrooms

El-Todary (2012) notes that the virtual class consists of:

Direct communication with sound and image.

Chat text box.

File transfer and exchange between learners and teacher.

Follow-up to the teacher and his contact with each student individually or with a group of students through Private Message

The use of electronic programs to present PowerPoint slides

The use of educational programs that present movies and video clips

Start by asking written questions and polling users

Allow the entry of any student

Allow when students can speak or answer questions

Record audio and written lectures.

Advantages and disadvantages of virtual classrooms

Advantages:

Bassiouni (2000) think that the virtual classrooms have many advantages as:

Education at any time.

Individual and collective education.

Continuous interaction and the continuing response and continuous follow-up as a whole.

Teaching high-level skills such as analyzing and evaluation.

Significant drop in the cost.

Cover large number of students in different geographic regions and in different time zones.

The possibility of expanding without restrictions in number of students and their ages.

Instant communications reduce burden of backlogged communications.

No need to track presence or absence or monitor grades; all of that is in electronic form.

A large number of knowledge bases are deployed in virtual libraries, encyclopedias and research centers on the Internet.

Open several themes in discussion forums in the virtual classroom, which encourages students to participate without fear or anxiety.

The process of learning is no longer confined to a specific place or time or controlled by a strict schedule; the student can learn at any time and any place.
(Bassiouni, 2000)

Disadvantages

The disadvantages of virtual classrooms: (Abdulaziz, 2008,134)

The lack of the necessary infrastructure in many villages and hamlets; Internet and high-speed connectivity is required for virtual classroom systems and software.

The lack of security in software so the virtual classroom can be penetrated at any time

Learners need special skills to deal with computers, especially internet skills.

The need to provide appropriate educational content based on the standards of electronic software design to be published in an understandable language for the learner.

Instructional design for virtual classroom courseware

The process of instructional design represents one of the functions of educational development in technical education. Instructional design links learning theory and educational practice to specify of teaching behavior to achieve the desired educational outcomes (Moosa, 2005).

The process of instructional design can be linked to the process of teaching with all its components. If the teacher follows a traditional plan to prepare lessons within the framework of technical education, especially in education through the media, he must apply the concept of systems where he designs the teaching process as a system that consists of elements (inputs) that interact together (treatment) to achieve specific objectives (outputs) (Saleh 0.1423).

The educational designer builds a model for designing educational programs by adopting a comprehensive view and methodology for the educational situation in all its aspects. The design usually consist of several steps which are similar to each other. These steps may include the analysis and setup phase, development and implementation phase, experimentation or application of what is learned, then the final stage which is an evaluation phase. (El-Moosa, 2005)

Because of the similarity between the terms of the process of designing educational systems and the terminology and procedures used in applied science, some educators refer to instructional systems design as Instructional Engineering. This may leads to a negative response from educators who believe this approach is a simplistic shorthand for a highly complex process, the educational process. They are concerned that attempts to automate this process through instructional media may limit learner creativity, especially if the educational design is based on process-oriented goals or procedural measures, and where achievement is measured through tests integrated into the media or learning management system.

The concept of full skill display style

This concept refers to displaying the skills performance in its entirety without breaks or a series of steps so that the learner see inter-relationships simultaneously. (Zidane 0.2006) The skill requirements in terms of speed is also a reason to use this method.

This style of display is an important way to teach skills that cannot be partitioned into small units. It fits easy skills and skills that are difficult to fragment. It may not be effective for teaching complex skills. Learning the skill in its totality without fragmentation, as in the partial style, is based on the type of skill to be fragmented, nature and degree of difficulty, the ability of the learner, and how quickly it is learned.

The concept of partial skill display style

This style of presentation offers partial fragmentation of sequences into smaller logical sequences. Each sequence holds an address on the interaction interface to enable the learner to watch each stage separately and deal with sequences in a linear or non-linear way. The partial style stands on the understanding that every part will be taught and mastered and that mastery is achieved after training on each part, and then in combination, to demonstrate performance of the skill as a whole. Skills with a high degree of difficulty and complexity may be difficult to learn especially for beginners, forcing the teacher to fragment those skills into smaller parts to be learned and mastered, then moving to another part, until the entire skill is learned.

Skill display style at virtual classroom programs

Results of studies and research on the best style of display sequence to learn skills are not consistent. There are those who found that the learning by full display is better because it helps to recognize the relations between the skill parts the thing that leads to quick and sufficient learning. Others advocate that partial display style is better because the learner needs times to master small steps in order to be able to perform the entire skill. And there is a third set of studies that refer to both styles and don't differ in the results. Some of these studies are shown below:

Samrah (2005). A sample of 48 students was divided randomly into 2 experimental groups then divided again into 4 experimental groups of 12 students. The study results in that display style sequence skill (partial display followed by a fully display / a fully display followed by partial display) did not affect cognitive skill achievement to connect, prepare and use a video camera in the fourth year of learning technology department. There was a positive gain in performance when partial display was followed by a fully display.

Attia study (2008) consists of (80) students who were divided into 20 motivated students who study by skill display style (partial-fully) and 20 motivated students who study by skill display style (fully-partial) and 20 slow students who study by skill display style (partial-fully) and 20 slow students who study by skill display style (fully-partial). The study results showed that there is no statistically significant difference between the mean scores of the two experimental groups in achievement associated with cognitive side as well as skill in the performance of the skills to run the monitor screen crystalline.

Abdul-Aziz study (2006), consisted of (120) students divided into four groups, each group consisting of (30) students. The first group was subjected to the educational program of the computer processor using self-corner in the overall width of the digital video sequences of the synergies necessary for skill formation holographic paper. The second group was subjected to computer education program the processor using the angle of self-presentation in the fragmented digital video sequences to the synergies necessary for skill formation holographic paper. The third group was subjected to the educational program of the computer processor using the integration between subjective and objective angles in the overall width of the digital video sequences of the synergies necessary for skill formation holographic paper. Group D was subjected to computer education program the processor using the integration between the angles subjective and objective in the presentation of the fragmented digital video sequences for the synergies necessary for skill formation holographic paper. The study results showed statistically significant differences between the average results of the two sets of experimental research in the rate of

performance skills formation holographic paper in favor of the partial offer for digital video sequences in the acquisition students acquire the skills required synergistic.

Research producers

Designing and building an instructional model to measure the effect of display style sequence skill at virtual classrooms programs on the first-year secondary school students' cognitive achievement and programming skills.

After watching the last models, the researchers used a suitable model for learning via internet environment (El-bate', 2007) to be an applied model for the instructional design through the internet from the structural perspective which represent practical guide lines to the instructional designer through designing e-learning environment on the internet that rely on the theoretical principles. This model consists of six main levels which are; analyzing, designing, production, experimentation, display and evaluation. The following discusses the critical elements for each stage:

Analysis phase

Analysis phase has several steps:

Analyse the students' characteristics: choose the students who possess the requirements of online study: own a computer connected to the Internet to get distance learning at any time; skills to use computers, Internet and e-mail; a strong desire to enroll in the study of the curriculum.

Identify the general objectives of the curriculum: the overall objectives of the curriculum should be determined and formulated in general terms, to explain what will be taught in general without going into detail.

Identify learning tasks and activities: this step identifies learning tasks and activities that must be accomplished when students study the curriculum online. Those tasks and activities include:

- Use search engines provided with the courseware to complete learning tasks or activities.
- Visit, review and read the content of site carefully, then summarize information that is closely linked and relevant to learning tasks or activities.
- Participate in and manage panel discussions, whether Synchronous as in chat rooms or asynchronous as in the discussion forums.
- Send e-mail messages and receive them among students and to the teacher.
- Contribute solutions or conclusions for learning tasks and activities.
- Support active and positive knowledge and skill building by giving responsibility for practical tasks to the student and recognition for their performance.

Analysis Infrastructure: The objective of the analysis of the educational environment to determine the following:

Budget: where you should allocate a specific amount of money for having a web site to display the curriculum.

Classrooms: This kind of learning doesn't require any classrooms.

Hardware: Because students who are studying online have computers connected to the Internet, they are not in need of equipment provided by the educational institution.

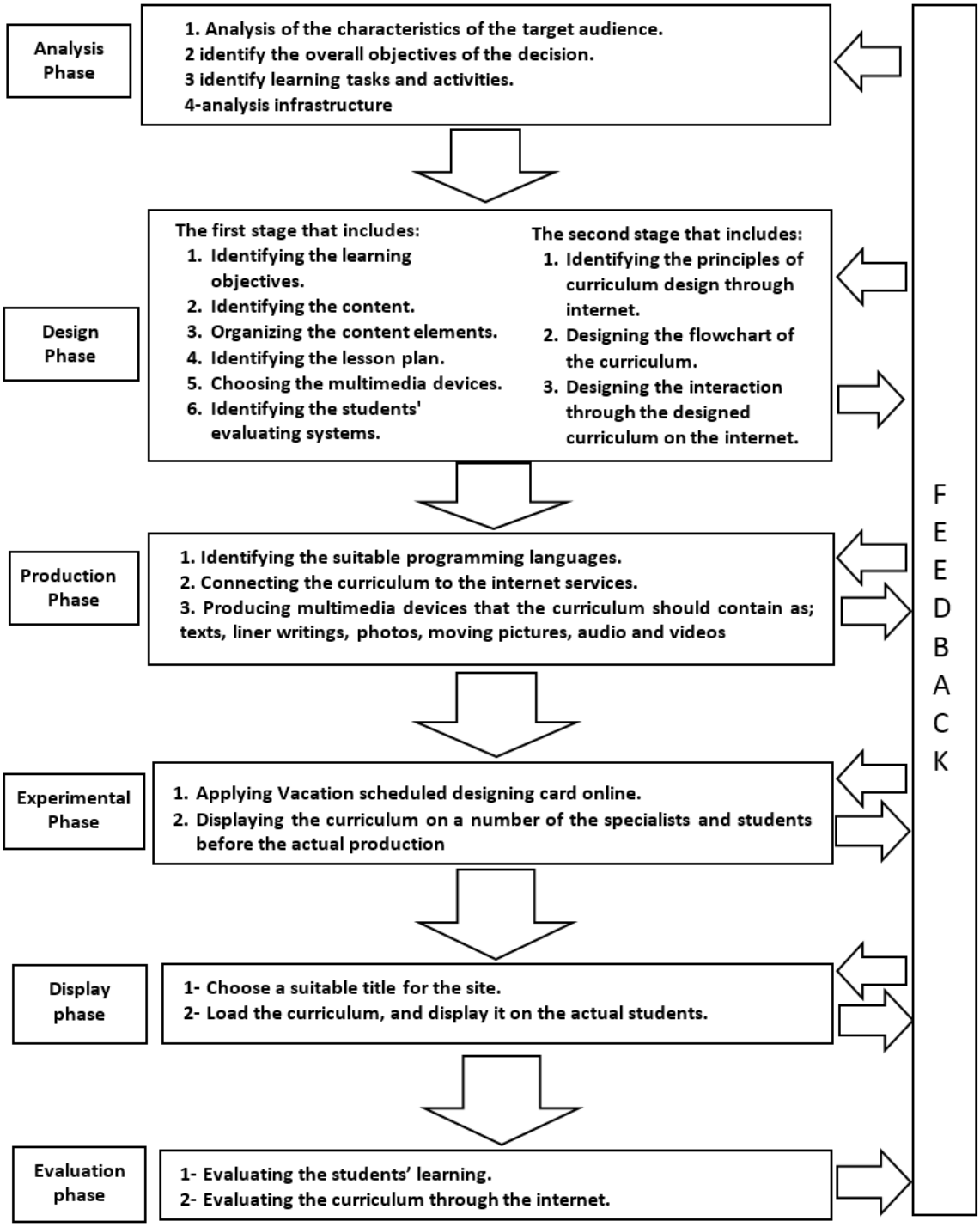

Figure 1: Elbate' model, 2007

Design phase

This phase includes two main levels, which are fully described below:

Determine the educational objectives of the curriculum: They must be formulated from the constructivist perspective in the form of the purposes for the general tasks of learning that all students seek to achieve.

Determine the content of course: the structural perspective is set on not to previously identify the curriculum in detail; because the learner who is looking for this detailed information, and in doing so he builds his own acquaintances.

Organize course content: a structural perspective does not identify the content sequence strictly in advance, because this prevents the construction process, which leads to a detailed description of the organization the curriculum from structural perspective where every lesson of the curriculum lessons include the following elements:

- **Unit number and address**. Then the lesson number and address.
- **The general object of the lesson**: that should be formulated in the form of a general purpose to the learning tasks.
- **Boot to the subject of the lesson**: It aims to stimulate the mind of the student about the subject matter on one hand, and the task that will be raised by the other hand.

Determine a plan to navigate the lessons of curriculum content: must translate the basic principles of constructivist learning perspective to a number of procedures that should be followed when dealing with curriculum lessons; they are as follows:

- Divide students into small working cooperating groups, the number of each group between 4-6 students, so that members of each group is collaborating on achieving the tasks of learning through dialogue and discussion.
- Identify a coordinator for each group responsible for sending the findings of the members of his group from information to the teacher via e-mail.
- The teacher participates in each group as a main member for guidance and counseling, if needed.
- Create a record of achievement portfolio for each student individually, and for each group together; to ensure the seriousness of each individual in the group in the completion of learning tasks and activities.

And to have students solve learning tasks and activities from the constructive perspective and reach a solution, we should do three steps:

1. Each student searches individually about the required information using search engines provided by the curriculum, saves the findings after summarizing them on his computer, and sends a copy to the teacher to be added to his record of achievement.
2. Each student the findings of information within his/her group, through chats and discussion forums provided by the curriculum, and send what the group accepts via email to the teacher.
3. The coordinator of each group displays what information his group gets to know that is related to learning tasks and activities for the entire group, to finally to solve the learning tasks and activities.

The role of the teacher at every stage is to direct and guide, and encourage students to engage in dialogues with each other and with him, create opportunities for students build new knowledge and deep understanding, and encourage his students to question and inquire through asking questions to provoke their thinking.

Production phase

This phase includes many steps as following:

Determining the appropriate programming languages: HTML language is used to build curriculum pages characterized by stability. You can also use PHPand Java Script languages to create an interactive course.

Linking the curriculum to online services: such as direct dialogue, discussion forum, e-mail, and search engines.

Writing texts: you can use many programs to write texts such as Microsoft Word XP and Microsoft FrontPage XP.

Inclusion of still images and diagrams: through the inclusion of automated forms, colors fill effects and using programs such as Paint, Adobe Photoshop, and other applications available on the Internet.

Selection of animation: sometimes animations should be designed as web pages in the course; also files of ready-made computer programs on the Internet.

Choose the sound: Sounds for the curriculum may be recorded, or chosen from audio files recorded on CDs or from the Internet.

Inclusion of videos: Videos may be included within the curriculum in a functional way.

Experimentation phase

This stage aims at the examination of the curriculum and be sure of its suitability for use by students, as well as testing it before actual use on the Internet. This phase has two major steps which are: 1) have a group of specialists in the field apply the evaluation card to the online curriculum to identify the extent decision criteria are met in online course, and 2) try out the curriculum for a number of specialists in the field, as well for a number of students.

Display phase

After testing the validity of the course of the display, you must choose a company to provide hosting service and a Website; deploy the curriculum online at website address that it easy for the student to remember and access. Load the course materials and tools on the internet to allow actual students to study it. Keep in mind that the course needs to be updated periodically and have ongoing maintenance to test links and page load speed.

Evaluating phase

Measure the effectiveness of the online course in achieving the desired goals, examine actual use by students, and plan for future development.

Preparation and design research tools

The current research used a set of tools represented including:

A cognitive achievement test for programming with visual basic skills.

An observation card for programming with visual basic skills.

Achievement test

The researchers built an achievement test to measure cognitive learning connected to the visual basic studio programming language and the test passed the flowing steps:

Defining the test objective

This test aims to measure cognitive achievement of a sample of the first-grade of secondary school in the visual basic studio programming language. The researchers designed a set of objective questions that were applied on both of the experimental groups.

Formulating the test items

The researchers designed a 40 single element test using two types of questions: Multiple choice and True-False.

Write the test instructions:

After formulating the test items, the researchers created a set of easy to follow instructions. The researchers also indicated the method of recording the answers and included guidance and instructions to clarify the goal of the test, the number of questions, the importance of reading the question carefully and the allotted time to answer the test.

Designing model and answer key for the achievement test:

The researchers designed a model answer to the student that is clear and easy to use for both the student and the debugger on the basis of calculating one point for each correct answer and zero for the wrong answers for a maximum of 40 test items. The researchers also prepared an answer key to correctly identify every right and wrong element for each of the test items.

Preparation and examining the test in its initial edition

After the process of preparing the test based on cognitive goals, the researchers put these items into a table with behavioral objectives for review by a group of arbitrators who were specialists in the content and purpose for initial control for the test (Virtual honesty). This was to ascertain that:

Suitability of scientific and literal formulation for the test.

Relevance between the test and behavioral objectives.

Alternatives answers are suitable for (multiple-choice, true-false) questions.

In the light of the views of gentlemen arbitrators, the researchers made adjustments including: correcting some grammatical mistakes, modify the wording to clarify some questions and make them more appropriate to the objectives that they measure, change some of the alternatives that are abnormal or which might suggest the answer, and delete questions that lack suitability.

Statistical adjustment for the test

Check the honesty of the test:

The honest test is the test that measures what it is made to measure. To evaluate the sincerity of the test it should be offered on its initial picture to a group of the initial group of arbitrators in order to make sure of:

The clarity and accuracy of the formulation of the questions and instructions.

The relevance of the test questions with the behavioral objectives of the lesson.

The appropriateness of the test with the content of the proposed model.

Delete unimportant questions.

For the relevance of the questions with the cognitive skills objectives of the Visual Basic Studio, the arbitrators' answers were treated statically according to the percentage of the connection between the educational content and objectives. The researchers considered that objectives that arbitrators score less than 80% should be re-designed or eliminated.

The test judgment results in making some corrections which are:

Rewrite some phrases

Replace or delete words for greater clarity.

The arbitrators agreed on the validity of the test for it purpose, and the results of the arbitration opinion about the relevance of the questions with the goals was more 80%.

Consequently, the researcher's corrected the initial version of the test ready for use in exploratory experiment. The number of test questions in its final version are 30 questions with the value of (30) points.

Exploratory pretesting of the achievement test

After offering the test to arbitrators and making the required corrections, the researchers applied the test on another sample (not the study sample) of around 15 students for the purpose of:

Define the length of time for the test.

Calculate the ease and difficulty factors for each test items.

Calculate the stability factor of the test.

The time of test application

The researchers recorded the time for the first student to complete the test, and the time for the last student to complete the test, and calculated the time needed to answer the test questions.

Ease and difficulty factors

The researchers calculated the easiness and difficulties factors for each item of the test items, and the result was the item that has ease factor of more than(0.8), that is very easy, will be deleted, and also the item of difficulty factor of more than(0.2), which is very difficult, will be deleted. After deleting these items, the number of the items is 30.

Calculating the stability factor of the test:

The stability factor of the test means that the test will give the same results if we repeated them on the same individuals of the sample an in the same circumstances. The aim of measuring the test stability is to know how much the test is free of faults that may change the individuals' performance on the same exam.

The stability of this test has been calculated on the exploration sample (15 students) after applying the achievement test on them and having the student's results. The researchers used the method of retail midterm of (Sperman & Brown) and this method is summarized in calculating the correlation coefficient between the scores of the 2 test halves (the test was split into two equal halves). The first section includes the first score of the students in the single questions of the test and the second section includes the total grades of the students in related questions.

Table 1

Applying the cognitive achievement coefficient through the exploring experimentations.

	Number	Spearman – brown Coefficient	Guttman split-half Coefficient
single	15	0.883	0.861
related	15		

And with the stability of the results of the previous table (2) it is clear that stability coefficient for Spearman-Brown equals (0.883) and for Guttman equal to (0.861), which are high stability factors and we can say that the overall stability coefficient between the halves of the test is approximately equal to (0.87)

Thus, we can say that the test could give the same results if re-applied to the same sample under the same conditions. This reassures the researchers that the test is a valid tool for measuring achievement in the current study.

Evaluating the degree and method of correction

It has been evaluated one point for each item the student answers correctly and zero for items that the student misses or answered incorrectly. The test total score equals the number of test items. The test became consisted of 30 items, and its final version is ready to be applied.

Skill performance observation card for visual basic programming studio skills

Preparing the observation card passes required the following steps:

Identification of the target of the observation card:

This card was designed to measure the level of first-grade students of secondary school skills at visual BASIC programming language before studying the effect of different style display skill.

Determining performances contained in the card:

It includes, in its final form (4) head skills and (31) sub-skills. The researchers determined that the skills must be arranged logically. The following aspects were also taken into account:

Description of performance in a short phrase

The phrase should be accurate, clear and short.

Each phrase must measure a specific and clear behavior.

Each phrase should start with a behavioral verb in the present tense.

The sub-skill must describe the main skill that it follows.

Develop a system to assess students' grades within the observation card:

The quantity evaluation has been used for the observation card as follows:

The card includes three options for performance (mastered the skill - mastered the skill with the help - not mastered the skill)

Rating grades are distributed on levels of performance in as follows:

Mastered the skill: If the learner did the skill accurately and successfully.

Mastered the skill with the help: If the learner did the skill with some mistake and the mistake has been corrected with the help of the teacher.

Not mastered the skill: If the student failed to do the skill at all.

Table 2
Quantity evaluation for performance levels

Performance level			
Level of mastering the skill	Mastered the skill	Mastered the skill with help	Not mastered the skill
Rating grades	3	2	1

The learners' skill performance will be recorded by adding a (√) in front of the level of skill performance and by collecting these points we can get the total points for each student to judge his performance in the written skills. The maximum total points of the card equals 93 points.

The initial version of the observation card: after the completion of target identification from observation card and analysis of the main axes of the card to have the sub-skills and renderings,

the observation card was drafted in its initial version, which consisting of (4) main skills containing (31) sub-skills.

Adjusting the observation card: The process of the verification of the sincerity and stability of the observation card to see validity as a tool to evaluate performance of the required skills was verified in accordance with the following procedures:

Verify the sincerity of the observation card: It was reviewed by arbitrators and experts in the fields of curriculum and teaching methods and technology education to ensure procedural formulation of the card items, clarity, and ability to note the skills. Some amendments were suggested by the arbitrators and were incorporated.

The stability of the observation card: Stability factor was calculated by the multiplicity of observers on the performance of each student manner, and then calculate the agreement factor between their evaluations.

The researchers hired two colleagues to view the observation card with content and instructions used in its application, observe the performance of three students, and then calculate the agreement factor for each student as following:

Table 3

Agreement factor in performance of three students

Agreement factor of the first student	Agreement factor of the second student	Agreement factor of the third student
88%	91%	85%

From the table we can get that the average of agreement factor at the three student's case equals (88%), and this means that the observation card is highly stable as a tool of measurement.

Final version of the observation card

After being sure of stability and sincerity of the observation card, the card was finalized ready to measure the performance of the first grade secondary school students at visual basic skills.

Experimental design of the research

The research community included first-grade students of secondary school for the Department of Education in Jeddah province at Mecca, academic year 1434-1435. The research sample of (60) students was selected and distributed into two groups as follows:

First experimental group: learn using the method of total or fully-partial skill display. The number of the group members (30) students.

Second experimental group: learn using the method of partial-total or fully skill display. The number of the group members (30) students.

Research methodology: The researchers used the experimental method to measure the impact of the independent variable (presentation skills) belonging to the two variables (performance skills – cognitive achievement). The research sample was divided, as previously mentioned, into two equal groups, where pre and post research tools were applied to them.

Table 5
General shape of the experimental design used in this research

Study group	Pre-application	Experimental management	Post-application
1st experimental group.	Achievement test Performance observation card	Using total or fully-partial display style	Achievement test Performance observation card
2nd experimental group.		Using partial-total display style.	

The experimental study

The researchers implemented the experimental study of the research at the period between 06.20.1435 and 28.06.1435 and that was according to a number of sequential steps and procedures as follows:

Obtain administrative approvals for implementation of the experimental study:

The approval on the instructional study program was obtained at the University of King Abdul Aziz on the application of the research experience, containing the address of the Director of Education administration in the governorate of Jeddah in order to facilitate the task of the researchers and enable the implementation of the study. The researchers chose Ibn Manzour secondary school to do the exploratory study, and the same school to apply the main experiment. The number of students in the first grade of secondary student equals 90 students. Supplement No. (6) contains a speech of post-graduates high studies program and speeches based upon to the management of the school chosen by the researchers for the implementation of this experiment.

Initial settings for implementation of the exploratory study for the research: The researchers implemented the exploratory study in Ibn Manzour to validate and control the tools used, then implemented of the basic experimental study in the same school.

Pre-implementation of the research tools

Implementation of achievement test

Pre-application of cognitive achievement test applied to basic research sample. (first experimental group, second experimental group) on 15/6/1435 AH

Application of the Visual Basic skills observation card

The observation card was pre-applied on two groups (first experimental group, second experimental group in the period from 06/16/1435 until 06/18/1435 AH. This process was assisted by one of the computer teachers at the school to ensure equality of the two groups before the application and determine the level of the students.

Ensure the homogeneity of the two groups

Then, the researchers used the "Independent" T-Test for the independent samples in the program of statistical packages for social sciences SPSS VER (16) to identify the extent of the homogeneity of the two groups through the results of the pre-cognitive achievement test. The following table shows a summary of the results of the statistical analysis of the application of the pre-test of cognitive achievement.

Table 6
Summarizes the T-test results of the homogeneity of the two groups at the pre-applied achievement test

The Group	N	Mean	STD DEV	T-test			
				DF	T	SIG	
First experimental group Total display style	30	10.76	3.18	58	.977	.412	Not statistically significant
Second experimental group Partial display style	30	10.09	3.42				

Extrapolating results from the previous table, we note that the value of "T" amounted to (0.977) with the degree of freedom (58) and the level of significance of the ability (0412). A level of significance greater than (0.05) refers to the lack of statistically significant differences between the mean scores of students of the two groups in the pre-achievement test, which indicates the homogeneity and equality of the two groups before the experiment.

Then, the researchers observed a pre-observation card application on two sets of research to identify the extent of the homogeneity of the two groups by the results of performance skill. Using the test significance of differences between the averages "T." "Independent samples T-Test" for independent samples in the statistical program packages for social sciences SPSS Version (16) have been identified over the homogeneity of the two groups. Table (7) follows a summary of the results of the statistical analysis of the application of the pre-observation card.

Table 7
Summarizes the T-test results of the homogeneity of the two groups at the pre-applied observation card

The Group	N	Mean	STD DEV	T-test			
				DF	T	SIG	
First experimental group Total display style	30	15.97	3.18	58	.977	.522	Not statistically significant
Second experimental group Partial display style	30	15.13	3.42				

Extrapolating the results from the previous table, note that the "T" was (0.977) when the degree of freedom (58) and the level of significance of (0.522), a level of significance greater than (0.05) refers to the lack of statistically significant differences between the mean scores of students of the two groups in the application of pre-observation card, which also shows the homogeneity and equality before the implementation of the two sets of search experience.

Based on previous findings that point to the homogeneity and equality of the two sets of research in cognitive levels and skill before the implementation of the experiment, it could be argued that any differences may appear after the implementation of the experiment will be attributable to the different levels of the independent variable, which will be attributable to the different style sequence display skill (total -partial) and not to the differences that already exist between the two groups before the experiment.

The actual application of the experimental study of the research

After the researchers make sure of homogeneity and equality of the 2 experimental groups, he started to apply the main experiment of the research, where the two groups have been taught the unit of the visual basic studio programing as following:

The first group students have been trained with the total or fully skill display style.

The second group students have been trained with the partial skill display style.

The post implementation for the research tools

After the research experience has been done and the students have been taught according to the suggested display style, the researchers then re-applied the research tools after the experience on the two experimental groups to measure the effect of the independent variable with its two levels on the following variables. The post achievement test has been applied on the two groups on Sunday 5/7/1435. The post observation card has been applied on the two groups on 6-7/7/1435 with the help of the computer teachers at the school, recording the results and statically analyze with suitable statistical means.

The research results

First: Testing the validity of research hypotheses

After viewing the proceedings of the study, and the completion of the basic experience, and monitoring students grades at both groups (experimental first and second) on the test grades (before - after), which measures the cognitive achievement for programming skills using Visual Basic Studio, as well as for observation card (before - after) that measure the performance of programming skills using Visual Basic Studio for the secondary school students.

The results of cognitive achievement test

The results of applying the post achievement test on the two experimental groups (total-partial/ partial-total): To check the validity of the first hypothesis that says

> "There is no statistically significant difference at the level of (0.05) between the average of the scores of students in post cognitive achievement test at the first experimental group that its members studies with the total or fully style of presentation and the second experimental group and its members who study with the partial style of presentation"

Significance of differences was calculated using (T-test) was reached results shown in the following table (8) "T" test and the level of significance of the difference between the mean scores of the two experimental groups in post achievement test.

Table 8

The difference between the mean scores of the two experimental groups in post achievement test.

The Group	N	Mean	STD DEV	T-test			
				DF	T	SIG	
First experimental group Total display style	30	83.700	4.442	58	4.079	0.02	statistically significant
Second experimental group Partial display style	30	87.800	3.252				

By the stability of the results it is clear that the value of (t) is not statistically significant at "There is no statistically significant difference at the level of (0.05) between the average of the scores of

students in post cognitive achievement test at the first experimental group that its members studies with the total or fully style of presentation and the second experimental group and its members who study with the partial style of presentation."

This means that the two styles of skill display don't differ for the achievement, and this research result refers to that the main effect of the two styles of skill display is nearly the same, the thing that allow width and flexibility at using both styles while using Virtual classrooms programs, which specially concentrate on the achievement sides of skill performance, especially if the future research results support the result of this study. The current research comes to prove the second point of view that sees that no one of both styles can override the other one in what concerns the cognitive achievement, so both styles works with the students in what concern the cognitive achievement.

Choosing any one of the two styles depend on the kind of the skill and how complex is it, so the more complex is the skill, the more steps it take to be learned, but we should have in mind that some complex skills that can't be divided into smaller parts.

The research results agree with the results of the study of Asmaa Attia(2008) and the Samera study(2005), where we couldn't find any differences between the first experimental group students and second experimental group students.

The results of the observation skill card:

The results of applying the post observation card the two experimental groups (total-partial/ partial-total): To check the validity of the second hypothesis that says;

> There is no statistically significant difference at the level of (0.05) between the average of the scores of students in post observation skill card at the first experimental group that its members studies with the total or fully style of presentation and the second experimental group and its members who study with the partial style of presentation.

Significance of differences was calculated using (T-test) was reached results shown in the following table (9) "T" test and the level of significance of the difference between the mean scores of the two experimental groups in post observation skill card.

Table 9

The mean scores of the two experimental groups in post observation skill card.

The Group	N	Mean	STD DEV	DF	T	SIG	
First experimental group Total display style	30	25.933	3.59	58	.608	0.312	Not statistically significant
Second experimental group Partial display style	30	25.33	4.037				

By the stability of the results it is clear that the value of (t) is statistically significant at the level of (0.05), and this indicates that the second hypothesis of the research, which " There is no statistically significant difference at the level of (0.05) between the average of the scores of students in post observation skill card at the first experimental group that its members studies with the total or fully style of presentation and the second experimental group and its members who study with the partial style of presentation"

Results discussion and interpretation

The results refers to that there is a statically significant at the level of (0.05) between the average of the students grades of the students scientific performance who studied by the (total-partial) display style on the observation card of the scientific performance of programming skills using

visual basic language for the benefit of the students who studied according to display style sequence skill (partial-total).

This result is consistent with constructivist theory:

> We find that from the principles of Bruner's theory of learning that we should take in mind the sequence or sequence in the presentation of the educational experiences. So, we can recognize and understand the progress of the students who studied the program by skill display style (partial-total) than those who learned by the other total-partial style.
>
> Bruner states that there are many equal sequences in displaying the skill and that most active of these sequences is connected to growth and its progress inside the learner. It is characterized by the skill display follow up or sequence, which corresponds to sequence skill on the current study, where the student starts to learn the skill partially then totally, then totally-partially with the permeation of educational activities after each skill. It also agreed with what Mager (1963) found - that the students prefer to start from the smaller parts to the more complex parts;
>
> The students preferences usually start from the part, not from the full, especially to learn movement skills
>
> Displaying the skill partially-totally helps the learner to build a clear concept of the skill while learning it in detail, the thing the thing that helps him to perform the skill.
>
> Education systems that stand on virtual classrooms are full of elements that address many senses from the students senses such as the sound, pictures, music, written text boxes, videos, and many other elements, that increases the likelihood of learning and increases the motivation of the learner to study the elements of the skill, which leads to mastering the programming skills using visual basic studio language.

Results of the current research agree with the studies of Raafat Bukhari(1997) and Emad Samrah (2009), that determined there is a statically significant difference between the first experimental group and second experimental group at the post application of the observation card.

Recommendations and proposals

Based on the findings of the current research, we can offer the following recommendations:

> Presenting the skills using Partial-total sequence style has a great effect on developing programming skills using visual basic studio. The researchers recommend the importance of following this sequence while teaching practical curriculums.
>
> Allow complete opportunity for students to practice programming skills to reach mastery.
>
> Use benefits from the different evaluation methods when evaluating theoretical and practical sides of student performance for the educational curriculum.

Suggestions for more researches and studies

> Conduct more researches and studies about display style sequence skill at virtual classroom programs in different curriculums to reach the best interaction style at displaying skills and developing the practical performance of the different skills.
>
> Conduct similar studies to the current study, discussing different ways of sequence and its effect on improving many other skills of the students of special needs.
>
> Study the effect of using virtual classroom programs on the students acquiring for some high skills such as creative thinking and problem solving.

References:

Abdulaziz, Hamdy Ahmed (2004). E-*learning; Philosophy, Principles, applications and tools*. First Edition, Oman, Bait Elfikr.

Abed, Ataya Yousef (2007). *The effect of a suggested program to improve technology teachers' programing skills at Gaza*. Published Master study, Education faculty, Islamic University at Gaza.

Abuo Hashem, El-sayed (2004). Skills Psychology. Cairo, Zahraa El-sharq Library.

Abuo Ward, Ehab Mohammed (2006). The effect of multimedia programs on acquiring basic programming skills and the trend towards material technology for tenth grade students. Published Master study, *Education Faculty*, Islamic University, Gaza.

Ali et al (2009) *Electronic learning and traditional learning: a comparative analyzing* study. A published research at Baghdad faculty of Economic science magazine. Nineteenth edition.

Attia, Asmaa Mahmoud (2008). The effect of the connection between skill display sequence styles and the learners' cognitive style at Educational computer programs on the efficient skill performance of the education technology students. Unpublished research, *Education faculty*, Helwan University.

Bolstad, Rachel, & Lin, Magdalene. (2009) *Students' experiences of learning in virtual classrooms*. Final report prepared for the Ministry of Education New Zealand.

Bukhari, Raafat (1997) *Using multimedia means in Education technology training at specific Education faculty at El-Minya on some video programs production techniques*. Unpublished research, Education faculty, Helwan University.

Crisan, Alina & Enache, Roxana. (2012) Virtual Classrooms in Collaborative Projects and the Effectiveness of the Learning *Process. Procedia Social and Behavioral Sciences*، 76: 226-232.

El-baghdady, Mahmoud Reda (2011) virtual learning environments. Published research, *Education faculty*, Fayoum University.

ElHila, Mohammed Mahmoud (2005), *Education Design*, Third Edition, Oman, Dar El-Masira for publishing.

El-Kilani, Tayseer (2004). *Direct and virtual electronic Distance learning.* Beirut, Lebanon Library, publishers.

El-Mobarak, Ahmed Bin Abdulaziz (1424AH) *The effect of teaching with virtual classrooms via the internet on the achievement of Education faculty students in teaching and connecting techniques at King Saud University*. Master study – teaching means and technology. Education faculty. King Saud University, Riyadh.

El-Moosa, Abdullah Bin Abdulaziz, El-Mubarak, Ahmed Bin Abdul Aziz (2005), *Electronic Learning; Principles and applications*. First Edition.

El-saleh, Badr Bin Abdullah et al (1423 AH). *Frame of Reference for Learning Resources Centers*. The Arabic Educational office for Arab Gulf States.

El-sayed, Mohammed Adam (1425 AH) *Distance training technologies. Work paper presented to the third Saudi technical Conference and Gallery* - The public institution for the technical education and vocational training.

El-Todary, Awad Hussien Mohammed (2012), *The E-School and the teacher's modern roles*. Riyadh, El-Roshd University.

Khalif, Zouhair Nagy (2009) *Evaluating the experiment of using virtual classrooms to present lessons for the students of the secondary school*. Research paper presented to participate in: instructional process at the twenty-first century: Reality and challenges.

Loureiro, Ana,& Bettencourt, Teresa. (2011) The Extended Classroom meeting students' needs using a virtual Environment. *Procedia Social and Behavioral Sciences*، 15: 2667-2672.

Mahdy, Oqeal Suliman (2005). The effect of using total and partial learning methods on learning freestyle and backstroke swimming. *Physical education Journal*, Baghdad University.

Moustafa, Mohammed (2012). *The Efficiency of virtual classrooms on improving computer science Digital Photos processing skills at Kingdom of Saudi Arabia.* Master study – Arab research and study institute.

Samrah, Emad Mohammed (2005). The effect of skill display sequence style in multimedia computer programs on the development of cognitive achievement and video camera using skills for activated and slow students at Education technology department. Published research, *Education faculty*, Al-Azhar University.

Subramaniam, Nantha, & Kandasamy, Maheswari. (2011) The virtual classroom: A catalyst for institutional transformation. Australasian Journal of *Educational Technology*, 27: 1388-1412.

Zaitoun, Hassan Hussien (2005)*comparing the effect of using virtual classroom technology at individual learning on the achievement of the third grade preparatory school students at English language skill in the sultanate of Oman and their directions towards them*. Master study - instruction and curriculum department. Mutah University.

Zaitoun, Hassn Hussien (1425AH).*Teaching skills*; a vision in applying the lessons. Cairo, Book world.

Zeidan, Ashraf Ahmed (2004). *The effectiveness of computer visual stimuli in the educational video programs on the prompt collection delayed*. Published research, Helwan University.

Zein El-Din, Mahmoud Ahmed (2006) *the effect of the E-learning Experience at the Egyptian preparatory schools on the educational achievement of the students and their feelings towards it*. Research paper represented to the second scientific conference of Specific education faculty, Suez University.

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Editor'sNote: This is a carefully detailed study to determine the value of a genre-based approach to teaching and learning writing skills in English. By focusing on purpose and meaning, it provides an effective structure to develop writing skills for situations beyond passing a writing test.

The effect of genre-based approach on enhancing Iranian law students' writing skill

Kazem Najmi
Iran

Abstract

This research is an endeavor to examine the impact of genre-based approach on students' writing performance as well as students' attitudes towards the implementation of genre based approach in learning to write. Research findings reveal that most students gained control over the key features of the required recount genre in terms of social purposes, language features and schematic structure. The necessity and usefulness of the application of teaching-learning cycle into learning the recount genre was predominantly recognized among students.

Keywords: genre-based approach, teaching writing, EFL

Introduction

Writing skill is believed to be difficult for EFL students in language learning (Richards, 1990). According to Richard and Renandya (2002), the difficulties include those to (a) generate and organize ideas using an appropriate choice of vocabulary and (b) to put such ideas into intelligible text. For Iranian EFL students, besides these difficulties, they have to face many other obstacles when learning to write compositions in English. The first difficulty rests in the fact that English in Iranian universities nowadays is treated primarily as a compulsory subject for studying and for exam-driven purposes rather than as a tool for communication. Students have been asked to do the multiple choice tests on their final exams, which include several sections on grammar, vocabulary, reading comprehension and writing. In the writing section, students are asked to "rewrite" some sentences in another way but keep exactly the same meaning as the given ones, or to translate a whole paragraph in Persian or vice versa. They are also asked to repair word order in jumbled-word sentences or fill in the blanks with the suitable verbs or verbal phrases. Passing exams is vital for students' success, so a large number of teachers may spend most of the time teaching writing skills that help students pass the exams.

Secondly, the "so-called" teaching writing approach of composition deployed by teachers at present may expose some difficulties for students in the performance of the compositional writing skills. In terms of teaching English compositions, most teachers focus on providing their student writers with vocabulary relating to the required topic, and some guiding questions, in order to help them shape their ideas into the completed paragraphs. Teaching writing in this way only benefits them to an extent that it can assist them in producing the error-free texts following the models of correct language. However, it does not contribute to help students realize and master such features as purpose, audience, context and linguistic conventions of text that are the important features of any text-types.

In other words, writing classes in universities nowadays are still predominantly language-based writing classes that focus on sentence writing for sentence building tests, rather than focusing on creating compositions to serve the purpose of plurality of real readers outside the classroom context.

This research is an endeavor to seek ways that can both enhance students' writing skills and build positive perceptions towards learning these skills. The genre-based approach chosen in this research is to solve students' difficulties in learning to write English compositions.

Research questions

The ultimate purpose of this study is to find out the answers to the following questions:

1. To what extent can students' academic recount essays actually be improved with respect to social purposes, schematic structure and language features after their exposure to genre-based approach?
2. What are students' attitudes towards the use of the genre-based approach in learning to write?

Literature review

What is genre?

"Genre" refers not only to types of literary texts but also to the predictable and recurring patterns of everyday, academic and literary texts occurring within a particular culture (Hammond and Derewianka, 2001). In western countries, genre, either spoken or written, is often identified and grouped according to its primary social purposes. According to Swale (1990), the genres which share the same purposes belong to the same text-types. Derewianka (1990), identified six main genres according to their primary social purposes: 1) narratives: tell a story, usually to entertain; 1) recount: to tell what happened; 3) information reports: provide factual information; 4) instruction: tell the listeners or readers what to do; 5) explanation: explain why or how something happens and 6) expository texts: present or argue a viewpoint. These social purposes of the text-genres in turn decide the linguistic inputs of the text (i.e. their linguistic conventions, often in form of schematic structure and linguistic features). Specifically, schematic structure refers to internal structure or text organization of the text-type in forms of introduction, body and conclusion, Language features consist of linguistic aspects such as grammar, vocabulary, connectors, etc. that the writers use in order to translate information or ideas into a readable text.

Genre-based approach

A genre-based approach placed great emphasis on the relationship between text-genres and their contexts (Hyon, 1996). In doing so, it aimed to help students become effective participants in their academic and professional environment as well as in their broader communities (Hammond and Derewianka, 2001). The following are some characteristics of the genre-based approach.

> First, the genre-based approach emphasizes the importance of exploring the social and cultural context of language use in a piece of writing. The context decides the purpose of a text, an overall structure of a text in terms of language features and text features often in the form of linguistic conventions (Hammond and Derewianka, 2001; Hyon, 1996). This approach argues that students can only produce a composition to be successfully accepted by a particular English-language discourse community once they take the context of a text into account into their own writing.
>
> Second, this approach highlights the magnitude of the readers and the linguistic conventions that a piece of writing needs to follow in order to be successfully accepted by its readership (Muncie, 2002). According to this approach, any student who wants to be successful in communicating in a particular English-language discourse community needs to be able to produce texts which fulfill the expectations of their readers in regards to grammar, organization, and content.

Third, it underscores that writing is a social activity. This notion originated from the social cultural theory initiated by Vygotsky (1978). According to this theory, knowledge is best constructed when learners collaborate together, support one another to encourage new ways to form, construct and reflect on new knowledge. In this case, social interactions and participation of group members play a key role in developing new knowledge. In the writing classes, students are encouraged to participate in the activities of meaning exchange and negotiation with peers and the teacher. Learning writing in this way, as it is believed, can remove the feeling of isolation which bothers many learners when writing and, at the same time, help student writers have positive reinforcement of their knowledge of linguistics, content and ideas in the composing of texts.

Fourth, a genre-based approach to writing instruction looks beyond subject content, composing processes and linguistic forms to see a text as attempts to communicate with readers. This approach is concerned with teaching learners how to use language patterns to accomplish coherent, purposeful prose writing. Its central belief is that "we do not just write, we write something to achieve some purpose" (Hyland, 2002, p. 18). In this approach, student writers are requested to take the overall social purposes of a text into account when composing a text.

Fifth, this approach emphasizes the important role of writer-reader interaction on a piece of writing (Reid, 1995). First, a student writer using this approach is requested to specify or think about the intended and/or potential readers when writing in order to be able to select or anticipate appropriate content, language and levels of formality. He or she should always ask himself or herself some questions such as: *who will be my intended readers? Who might be interested in reading my text? What are their beliefs about a good piece of writing? What are their levels of English proficiency?* And *what are their educational and cultural backgrounds?* Similarly, readers when approaching the text should ask themselves questions such as: *for what purposes does this writer write this piece of writing? What is the writer's viewpoint when writing the text? What kinds of language features and organization does he/she use in the text?* Also, there always exists an interaction between a writer and his/her readers in the form of written communication despite the absence of readers.

Sixth, the teacher's role in this approach is viewed as authoritative rather than authoritarian (Rothery, 1996). As an expert in the classroom, the teacher provides students with systematic guidance and careful support through various activities so that students ultimately gain the control of written genres. At the same time, he/she recognizes the importance of students' contributions to the teaching-learning process.

Last but not least, the genre-based approach emphasizes the explicit teaching of the linguistic conventions of the genre for second language novice student writers (Christie, 1990). It is argued that students cannot produce a particular text-type successfully if they are not taught explicitly about linguistic conventions of that text-type with respect to language features and schematic structure. Therefore, making known these conventions to student writers, especially at the first stage of the instructional modules of particular text-types, is a very important task of genre-based teachers. In the classroom, teachers following genre orientation often employ the teaching-learning cycle that comprises the three phases, namely, modeling of a "sample expert" text, and joint-negotiation of text with teacher, and independent construction of text by individual students (Cope and Kalantzis, 1993).

Methodology

Participants

This study was carried out on tertiary level students studying for a B.S. in law in Payam-e-Noor University, Tehran. Forty five students were invited to take part in an experimental writing class in which the researcher used the genre pedagogy's teaching-learning cycle in order to teach the student participants to write on the biographical recount genre. This extracurricular writing activity was conducted outside their regular class hours in order to offer the student participants a lot of opportunities to practice more in the writing skills. Meanwhile, the four skills are still regarded as the key elements in the mainstream English course books in the regular-class hours at school.

Data collection and analysis

Research data was collated through student essays and a questionnaire for students.

Student essays

The essays collected were the ones written on the following topic: "Write about a famous person". The analysis of these essays was based on the three evaluative criteria of the recount genres developed and explained by Droga and Humphrey (2003). More specifically, the students' text analysis focused on:

> Students' control over the social purposes of the required recount genre: to give accounts of the most important events in the life of a specific character in history (for biographical recount genre).
>
> Students' control over the schematic structure of the recount genre. These include: the orientation phase, the sequence of events in chronological order phase and the re-orientation phase.
>
> Students' control over the language features of the recount genre. These include: focus on the main specific human participants, process types (i.e. material process, relational process and mental process), circumstantial adverbs of time, and the past tenses of verbs.

Questionnaire for students

A Persian version of questionnaire consisting of two parts, part A and part B, was designed to elicit students' attitudes towards the genre pedagogy's teaching-learning cycle and the recount genre. It was administered to forty five first-year students right after they had finished the instructional module for the recount genre. This questionnaire was composed of close-ended questions that were designed based on five agreement extensions, namely, strongly agree, agree, uncertain, disagree and strongly disagree, as proposed in Likert's work, which was published in the late 1920s.

This questionnaire sought to gather information about students' attitudes towards (a) the three phases of teaching-learning cycle and (b) the recount genre. It consisted of 33 items that were distributed in two parts in the form of close-ended questions (A, B). Part A with 26 items aimed at the three key phases of the teaching-learning cycle and part B with seven items aimed at the recount genre.

Data analysis and discussions

Analysis of students' biographical recount essays

Table 1 indicates that more than 80% of the students were successful in gaining control over the key features of the biographical recount essays.

With respect to the schematic structure, most student participants demonstrated all typical phases of a biographical recount essay, namely, an *orientation*, a *sequence of events* and a *reorientation*.

Table 1
Students' control over the key features of the biographical recount essays

Schematic structure					Language features			
Essays	Social purposes	Orientation	Sequences of events	Reorientation	Main participants	Process types	Past tense of verbs	Circumstantial adverbs of time
No	45	45	42	38	45	45	45	45
%	100	100	93.33	84.44	100	100	100	100

Specifically, in the orientation, they identified a famous person as the *main participant* and then provided the reasons for his fame in their orientation. Thus, they succeeded in revealing the social purpose of their essays: *To give an account of a famous specific character in the history*. In the same vein, in the sequences of event phases, they demonstrated their good understanding and good execution of typical features of a biographical recount genre by unfolding the major phases in the famous person's life in a temporal order, deploying proper circumstantial adverbs of time and proper verb tenses, and finally rounded off their essays by summarizing the famous person's contributions to the society.

Moreover, they were successful in deploying proper linguistic resources of the biographical recount genre by focusing on *one main participant*, using a variety of process types such as material process (a process of doing), mental process (a process of sensing), or relational process (a process of being) across the *schematic structure of their essays, using proper past tenses of verbs and circumstantial adverbs of time*. Interestingly, they also discerned how to use the other adverb elements such as *cause*, *place*, *result*, *purpose* and *concession* to make their whole essays hang together.

In a nutshell, it was evident from their essays that most of the students gained control over the features of the biographical recount genre.

Analysis of students' attitudes towards the teaching-learning cycle and the recount genre

Students' attitudes towards the teaching-learning cycle

This section displays the three themes which are the modeling of the recount genre, joint-construction of the recount genre and independent construction of the recount genre respectively.

Phase 1: modeling of the recount genre

This phase is subdivided into two sub phases: context exploration and text exploration

Context exploration

As indicated in Table 2, the majority of student participants (91.1%) reckoned that the activities in the context exploration was necessary and useful for them in the latter phases of learning writing (M =4.5). Concretely, 27 students accounting for 60% agreed that these activities really helped them in learning writing, in addition to 14 students (31.1%) expressing their strong agreement towards this statement. As a result, most of the students expressed their positive opinions from approval to strong approval (M ranged from 3.8 to 4.3) to the 7 remaining items (from item 1 to item 7) with respect to realizing the purposes of the recount genre, knowing the reasons why a writer writes the recount genre, identifying the audiences of the recount genre, knowing the situations where the recount genre can be applied, helping explore the contextual

factors affecting the production of the recount genre, helping activate their background knowledge and expressing their personal opinions towards the recount genre.

Table 2
Students' attitudes towards the activities in the context exploration of the recount genre

Student choice The activities in the context exploration	SA 5	A 4	U 3	D 2	S D 1	M 3.0
1. Realizing the social purposes of the recount genre.	20 44.4	20 44.4	5 11.1	0 0.0	0 0.0	4.3
2. Knowing the writer of the recount genre.	17 37.8	23 51.1	5 11.1	0 0.0	0 0.0	4.3
3. Knowing the intended readers of the recount genre.	17 37.8	23 51.1	5 11.1	0 0.0	0 0.0	4.3
4. Exploring the possible contexts of situation of the recount genre.	9 20.0	25 55.6	9 20.0	2 4.4	0 0.0	3.9
5. Realizing that the contextual factors can affect the production of the recount genre.	12 26.7	15 33.3	15 33.3	2 4.4	1 2.2	3.8
6. Activating their background knowledge.	15 33.3	25 55.6	5 11.1	0 0.0	0 0.0	4.2
7. Expressing their personal opinions or attitudes towards the recount genre.	12 26.7	15 33.3	15 33.3	2 4.4	1 2.2	3.8
8. Necessity and usefulness for them in the latter phases of learning writing.	27 60.0	14 31.1	4 8.9	0 0.0	0 0.0	4.5

SA= Strongly agree, A= Agree, U= Uncertain, D= Disagree, SD= Strongly disagree

Specifically, around 88.8% of the respondents affirmed that the activities in the context exploration could help them realize the social purposes, the writer and the intended readers of the recount genre. In the same vein, nearly the same number, 88% of the students, noted that these activities helped them realize in what situation this genre could be applied and roughly 90% of the respondents showed that these activities could activate their prior knowledge towards the recount genre. Although the criteria in terms of exploring the possible contexts of situation of the recount genre and expressing their personal opinions towards the recount genre were not warmly received with favorable opinions (i.e. the hesitation of the respondents dropped from high proportion 33.3% to low proportion 20%), 77.6% of them also expressed that these activities were really helpful for them.

Finally, roughly 60% of the respondents, albeit still predominant, reckoned that these activities could help them realize that the contextual factors could affect the production of the recount genre and that these activities were the good chances for them to express their likes and dislikes towards the recount topics which they were learning.

In short, the students' attitudes towards the activities in the first sub phase of the modeling of the recount genre were generally positive. Although there were some students showing their

uncertainty and disagreement towards some options in the items in this sub phase, they were just a few. Generally, all the activities in this sub phase actually facilitated and prepared them in the following phases of the teaching-learning cycle.

Text exploration

Table 3
Students' attitudes towards the activities in the text exploration of the recount genre

Student choice The activities in the text exploration	SA 5	A 4	U 3	D 2	S D 1	M 3.0
1. Realizing how the information is structured in the sample, recount genre to reach the purposes, audiences, content and text organization	21 46.7	19 42.2	5 11.1	0 0.0	0 0.0	4.4
2. Picking up the salient language features of the recount genre thanks to the teacher's explicit analysis of these features.	27 60.0	13 28.9	5 11.1	0 0.0	0 0.0	4.5
3. Picking up the salient schematic structure of the recount genre thanks to the teacher's explicit analysis of these features.	27 60.0	13 28.9	5 11.1	0 0.0	0 0.0	4.5
4. Realizing that each recount genre has different writing conventional rules.	30 66.7	10 22.2	5 11.1	0 0.0	0 0.0	4.6
5. Realizing that these conventional rules of writing differ from culture to culture.	22 48.9	10 22.2	9 20.0	4 0.9	0 0.0	4.2
6. Realizing that conforming to the conventional rules of a particular recount genre is very important when writing.	30 66.7	10 22.2	5 11.0	0 0.0	0 0.0	4.6
7. Necessity and usefulness for them in the latter phases of learning writing.	25 55.6	15 33.3	5 11.1	0 0.0	0 0.0	4.4

It is evident from Table 3 that the activities in the text exploration of the recount genre could facilitate students in learning writing in particular and in the latter phases of their learning writing in general. Indeed, 88.9% of them expressed their approval towards these activities with 55.6% higher percentage of strong agreement and lower percentage 33.3% of agreement. In turn, their strong belief entailed their agreement to the 6 remaining items (from item 1 to item 6). In addition, it was also noted that only 5 students expressed their uncertainty in the items 1, 2, 3, 4, 6 and 9/45 students expressed their hesitation in item 5 along with 4/45 students who expressed their disagreement. This indicated that almost all respondents expressed their positive opinions towards the activities in the text exploration.

Specifically, 88.9% of these students expressed that, with the sample text offered and analyzed by the researcher, they could realize how the information was structured to obtain social purposes, language features and schematic structure of the required text. 27/45 students (60%) strongly agreed and 13/45 students (28.9%) agreed that they were able to pick up the salient language features and schematic structure suitable for the required recount genre thanks to the researcher's analysis of the features in the sample recounts. Interestingly, 88.9% of the respondents, which was albeit 88.9% of the respondents in the item 7, reported that, in their viewpoints, conforming to the linguistic conventions of a particular recount genre was very important for them to learn

writing (88.9%). Finally, it was found in item 5 that 32/45 students (71.1%) agreed that the conventional rules of writing differed from cultures to cultures.

To sum up, the text exploration sub phase was really useful and necessary for students in learning writing. This was confirmed in their positive responses towards the aspects of the social purposes, language features, schematic structure and etc. of the required recount genre. This was in coincidence with the researcher's expectations. As identified in the conceptual framework of the teaching-learning cycle, the first phase – modeling – aims at providing the novice students with "tools" to construct the text in terms of social purposes, language features and schematic structure of a particular text-type because in this phase students themselves are still unfamiliar with these conventional rules. It turned out that after being taught with this first phase of the cycle, almost all students (88.9%) expressed their positive feelings towards it. Similarly to the context exploration, it was found in this sub phase that some of the students still expressed their doubtfulness and even their disagreement towards this sub phase. Nevertheless, the negative reactions from the respondents were very small. On the whole, they acknowledged that this sub phase facilitated them in learning writing.

Phase 2: The joint-construction of the recount genre

Table 4

Students' attitudes towards the activities in the joint-construction of the recount genre

Student choice **The activities in the joint-construction**	**SA** **5**	**A** **4**	**U** **3**	**D** **2**	**S D** **1**	**M** **3.0**
1. Applying the theories of the recount genre into practice.	21 46.7	18 40.0	4 8.9	2 4.4	0 0.0	4.3
2. Realizing that the preparatory phases are very important and necessary for constructing an effective recount genre	32 71.1	13 28.9	0 0.0	0 0.0	0 0.0	4.7
3. Knowing "what to write" in order to achieve the social purposes, language features and schematic structure of a particular recount genre thanks to the teacher's demonstration of the way of writing	31 68.9	10 20.0	1 2.2	3 6.7	0 0.0	4.5
4. Knowing "how to write" in order to achieve the social purposes, language features and schematic structure of a particular recount genre thanks to the teacher's demonstration of the way of writing.	31 68.9	10 20.0	1 2.2	3 6.7	0 0.0	4.4
5. Necessity and usefulness for them in the latter phase of learning writing.	23 51.1	17 37.8	5 11.1	0 0.0	0 0.0	4.4

Table 4 shows that roughly 90% of the student respondents thought that the activities in the joint construction phase were necessary and useful for them in learning writing (M=4.4). This was confirmed by the fact that nearly all of the respondents expressed strong agreement (M ranged from 4.3 to 4.7, items 1-4 in Table 4). In particular, 86.7% of them expressed that they knew how to apply the theories of the recount genre in terms of orientation, sequences of events in chronological order and reorientation into practice. The figure 8.9% of uncertainty and 2% of disagreement in this statement did not indicate the big differences in terms of negative attitudes in this item. More interestingly, the preparatory phases such as researching information from many sources (e.g. from internet, textbooks, newspapers, teachers and peers) got the most favorable

opinions (71.1% strongly agree and 28.9% agree). Finally, roughly 90% of the student respondents agreed that they knew "what and how to write" in each phase to achieve the social purposes, language features and schematic structure of a required recount genre in the independent construction phase of the recount genre thanks to their teacher's demonstration of the way of writing.

Briefly speaking, this phase was generally really helpful for students in learning writing. It served as a transitional sub phase of the first phase in transforming the theories they picked up into practice. This phase was successfully implemented thanks to the collaborative writing processes between teacher and students with teacher acting as a scribe. Although this phase also received unfavorable responses from the respondents like "modeling" phase, these negative reactions were just a few. On the whole, all of these activities were considered to be very necessary before the student writers were asked to write independently.

Phase 3: The independent construction of the recount genre

Table 5

Students' attitudes towards the activities in the independent construction

Student choice **The activities in the Independent construction**	**SA** **5**	**A** **4**	**U** **3**	**D** **2**	**S D** **1**	**M** **3.0**
1. Writing many drafts can help improve their own essays.	31 68.9	10 20.0	1 2.2	3 6.7	0 0.0	4.5
2. The constructive feedbacks of their friends towards their first draft is better their second drafts.	21 46.7	18 40.0	4 8.9	1 2.2	0 0.0	4.2
3. Feedbacks towards their friends' drafts can help them review the knowledge of the recount genre and realize their mistakes (if possible) in their own recount essays.	25 55.6	12 26.7	6 13.3	1 2.2	1 2.2	5.1
4. Teacher's feedbacks can help them realize whether their recount essays fulfilled the contents of the required recount genre or not.	30 66.7	15 33.3	0 0.0	0 0.0	0 0.0	4.7
5. Their final recount essays are much better improved after being given feedbacks and corrections by their friends and teacher.	18 40.0	21 46.7	15 13.3	0 0.0	0 0.0	4.3
6. These teaching writing techniques are necessary and useful for learning to write any text-types.	18 40.0	22 48.9	5 11.1	0 0.0	0 0.0	4.3

It is clear from Table 5 that the teaching writing techniques applied in the phase "independent construction of the recount" were really helpful for students (roughly 90%). From Table 5, it was seen that most of the students responded positively to the issues of writing many drafts, peer feedback and teacher's feedback (M ranged from 4.2 to 5.1). In terms of writing many drafts, roughly 90% of the respondents expressed that it did really help them improve their writing skills. As for their friends' feedback, 21 out of 18 students in the scale agreement extension strongly agreed that this activity could help them improve their second drafts (86.7%). That meant that in giving constructive feedbacks of their friends towards their first drafts, their friends could help them locate as well as point out to them the mistakes or errors in terms of vocabulary, structure, register, and style committed in their first drafts and at the same time suggested the ways of helping them revise their first drafts to become better. Also, they agreed that their feedbacks

towards their friends' drafts could help them review the knowledge of the recount and spotted their mistakes and errors in their own papers (82.3%). More importantly, teacher's feedbacks received the most favorable opinions (100%) in which 66.7% expressed their total agreement along with 33.3% of agreement. As such, they were of the opinion that their final written products were better improved after being offered the constructive feedbacks and corrections from their friends and teacher (86.7%). Like phases 1 and 2 above, besides the positive responses offered by students, the researcher still received a relatively small percentage of other respondents who both expressed their uncertainty and their rejection towards the usefulness of these teaching writing strategies used in the cycle needed more attention.

In brief, the last phase of the teaching-learning cycle did contribute to the learning of writing of students in this study. This was expressed in the high proportion of percentage of agreements towards the teaching writing techniques used by the researcher. Certainly, the positive responses of students were not by chance. The statistical figures actually indicated these positive attitudes.

Students' attitudes towards the recount genre

Table 6

Students' attitudes towards the recount genre

Student choice **The recount genre**	**SA** **5**	**A** **4**	**U** **3**	**D** **2**	**S D** **1**	**M** **3.0**
1. Suitability for their learning English at university	17 37.8	17 37.8	0 0.0	0 0.0	0 0.0	4.4
2. Suitability for their learning English in the near future.	12 26.7	22 48.9	11 24.4	1 2. 2	0 0.0	4
3. Suitability and interest for them personally	12 26.7	18 40.0	13 28.9	2 4.4	0 0.0	3.7
4. Suitability for their current English level	20 44.4	20 44.4	5 11.1	0 0. 0	0 0.0	4.3
5. Suitability for their age	21 46.7	17 37.8	5 11.1	2 4.4	0 0.0	4.3
6. Biographical recount genre stimulates them to learn to write	5 11.1	10 22.2	24 53.3	5 11.1	1 2.2	3.3

From Table 6, it was seen that all respondents agreed that the recount genre chosen for this study was suitable for learning English at a university (17 students agreed and 28 students strongly agreed). However, the following criteria regarding items 2-5 were not received with completely favorable opinions from the respondents although the positive responses in these items were found to outnumber negative responses. First of all, in terms of suitability for their learning English in the near future, there were 34 students expressing their positive feelings towards it (12 students strongly agreed and 22 students agreed) while 11 of them expressed their uncertainty and the other one student rejected this criteria. Secondly, in the next item (suitability and interest for them personally), while 30 out of 45 respondents responded positively towards it (12 strongly agreed and 18 agreed), 13 of them expressed hesitation and the other two students expressed their disagreement towards it. Thirdly, despite the fact that there were 40 respondents agreeing about suitability for their current English level, 5 of them also expressed their doubtfulness towards it.

With respect to suitability for their age, 38 out of 45 respondents expressed their approval while 5 expressed their doubtfulness and 2 expressed their disagreement. These pointed out that there were fluctuations in the attitudes of the respondents ranging from strong agreement, agreement, and uncertainty to disagreement towards the suitability and interest of the recount genre.

Lastly, in reference to item 6 (i.e. whether they thought the biographical recount genre could stimulate them to learn writing or not), it was seen that there were only 15 students expressing their positive feelings towards the biographical recount genre (i.e. 5/45 expressing their strong agreement and 10 expressing their agreement) while the number of respondents who responded uncertainly and negatively to this genre was very high (i.e. 24/45 respondents expressing their uncertainty plus 6/45 students expressing their disagreement towards this genre: 5 rejection and 1 complete rejection). This indicated that the biographical recount genre chosen for teaching writing in this study did not meet the great expectations from most of the student participants.

All in all, students' attitudes towards the recount genre enjoyed both positive and negative reactions from the respondents, among which positive attitudes outnumbered negative attitudes.

Apart/except from the criterion (suitability for their learning English at university), other remaining criteria (from item 2 to item 6) were not met with the great expectations from the researcher, especially in terms of stimulating them to learn to write the biographical recount and suitability for their learning English in the future.

Conclusion

Research findings demonstrate that a genre-based approach based on the three phases of the teaching learning cycle had a significant impact on the student participants. Indeed, most of the student participants gained control over the key features of the required recount genre, and at the same time, expressed their positive feelings towards this cycle as well as the recount genre applied in this study.

Although there were still some of the student participants who expressed their disapproval towards some activities carried out in each phase of the teaching-learning cycle and the recount genre, it was found that these negative reactions from the small number of participants did not considerably affect the results of the research.

In order to implement successfully this teaching-learning cycle of the genre-based program into their own actual classroom, teachers of English should introduce many well-written sample reading texts which contain the features of the specific text-types into their own classroom. As identified at the outset of this study, one of the difficulties faced by EFL students when they develop writing skills was that they lacked the knowledge of the text-type in terms of language features and text features; therefore, they did not know how to turn their ideas into their intelligible text. A sample "expert" and "selective" recount genre helped students realize its purposes, its language features and its schematic structure and they could use this knowledge to produce their own recount writing effectively.

Moreover, teachers should resort to the flexibility of the genre-based approach. In other words, teachers should not be too rigid in applying the three phases into their classroom. For more capable students who understand very clearly the modeling phase and want to further practice their writing skills, teachers can ignore their role as scribes. Instead, he or she should revise and correct their texts which approximate to the structure of the sample text. However, for those students who have not yet mastered the structure of the sample reading text, the role of the teacher as a scribe in the joint negotiation phase is still considered necessary.

References

Christie, F. (1990). *Genre as Social Processes*. A plenary Paper Delivered at the Meanjin Reading Council Regional Conference, Brisbane (March, 23-25), PP. 74-78.

Cope, B., and Kalantzis, M. (1993). Introduction: How a Genre Approach to Literacy can Transform the Way Writing is Taught. In B. Cope & M. Kalantzis (Eds.), *The Powers of Literacy*: *A genre approach to teaching writing*. London: Falmer Press, pp. 1-21.

Derewianka, B. (1990). *Exploring How Text Works*. Sydney: Primary English Teaching Association.

Droga, L., and Humphrey, S. (2003). *Grammar and Meaning: An Introduction for Primary Teachers*. Berry News South Wales: Target Text, p. 11.

Hammond, J., and Derewianka, B. (2001). Genre. In R. Carter & D. Nunan (Eds). *The Cambridge Guide to Teaching English to Speakers of Other Languages*. Cambridge: Cambridge University Press.

Hyland, K. (2002). *Teaching and researching writing*. Harlow, Essex: Longman

Hyon, S. (1996). Genre in Three Traditions: Implications for ESL. *TESOL Quarterly*, Vol. 30, pp. 693-732.

Muncie, J. (2002). Finding a Place for Grammar in EFL Composition Classes. *EFL Journal, 56*, p. 407-430.

Reid, J. (1995). *Teaching ESL Writing*. Upper Saddle River, NJ: Heinle and Heinle.

Richards, J.C. (1990). *The Language Teaching Matrix*. Cambridge: Cambridge University Press.

Rothery, J. (1996). Making changes: Developing an educational linguistics. In R. Hasan & G. Williams (Eds.), *Literacy in Society*. London: Longman.

Vygotsky, L.S. (1978). *Mind in Society: The Development of Higher Psychological Process*. Cambridge, Mass: Harvard University Press.

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Empowering school teachers with educational technology using the distance education mode

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Swaziland

Abstract

Educational Technology deals with defining objectives, analysis of learning situations, selection of methods and media, development of educational materials and evaluation tools, implementing and validating the teaching-learning process at levels ranging from pre-primary to university, formal to non-formal, including distance education. The classroom input needs to be strong for a quality process to result in quality graduates. The teacher plays primary role in classroom by using educational technology to function as a classroom manager.

Swaziland is a small developing country having 7551 Primary and 5024 Secondary teachers spread in 575 Primary and 227 Secondary schools. Distance education mode may be used for staff development regarding educational technology. The major objective of this research was "To develop and test a training package for teacher development in educational technology through distance education." The major hypothesis was "The proposed learning package, in the field of Educational Technology, would enhance teachers' competency at a significant level." There were 180 teachers for the pre-test; 67 completed the training and post-test. The sample of 67 teachers from primary and secondary schools was drawn using a stratified random sampling method with representation from rural and urban areas from all four regions of Swaziland. Participants had undergone a pre-test and a self-study of a book "Educational Technology for Effective Teaching" followed by contact sessions, group discussion and finally a post-test for knowledge, skills and attitudes towards Educational Technology.

The self-instructional book covered: 1) The nature and scope of educational technology. 2) Managerial approach to classroom communication. 3) Systems approach to teaching-learning process. 4) Bloom's taxonomy of educational objectives: its utility to classroom communication. 5) Pedagogy and andragogy in the teaching-learning process. 6) Instructional modes for classroom interaction. 7) Learning activity. 8) Learning theories for classroom communication. 9) Motivation, interest and emotions: meaning and role in learning. 10) Verbal and non-verbal communication. 11) Role of audio/video aids in the teaching-learning process. 12) Role of computers in the teaching-learning process. 13) Mastery learning for effective teaching. 14) Individual differences among learners. 15) Assessment, measurement and evaluation: meaning and utility for examinations. 16) Various types of test items and their application in examinations.

Participant's opinion was also measured using an Opinion Scale. The statistical analysis of pre-test and post-test data revealed that the proposed training package was highly effective for empowering school teachers with educational technology knowledge and skills. The participants had opined to make this staff development programme compulsory to all school teachers in Swaziland. It established the potential of Distance Education mode for staff development so that this mode might be used to train all school teachers in developing competency in using Educational Technology in the classroom. Also, the book supplied to them in self-instructional format may work as a guidebook to meet their future needs.

Keywords: educational technology, staff development, mix media, systems approach, effective teaching, self-instructional material, bloom's taxonomy, classroom communication, mastery learning, individual differences, distance education mode.

Introduction

Individual differences among students is a major problem for every teacher. It requires the teacher to integrate teaching aids, teaching methods, and classroom management activities enable as many students as possible reach to their optimum level of learning. Students come to educational institutions as raw material and leave as product. The quality of this product is never same or similar because of individual differences among students.

Educational technology is a tool to effectively manage classroom activities, adjust to the needs of students with a wide range of individual differences, and create a learning environment for optimal learning. Educational technology combines three major sciences– communication science, social science, and management science. Various instruments, electronic or non-electronic, come from the communication sciences. Knowledge of various physical and mental differences among students come from social sciences such as psychology and sociology. Managerial sciences have given teachers a new role as manager of learning. (Davies, 1971, 5-11) Davies book entitled 'Management of Learning' describes planning, organising, controlling/ leading and evaluating as four major managerial roles of a teacher in the classroom. A quality classroom experience integrates knowledge and skills from all of these disciplines to produce a quality outcome for every learner. It has necessitated empowering every teacher in Swaziland at Primary and High School level with educational technologies and the skill to use them. This is a staff development project using distance education mode. Face-to-face or induction effect modes are neither economical nor effective. Therefore, Distance Education mode has been considered as best fit for this project.

Objectives of this study

Overall goal

"To develop and assess effectiveness of a training package in Educational Technology for staff development among school teachers through distance education mode."

These are the specific objectives:

- Determine the significance of difference, before and after experimentation, regarding knowledge of Educational Technology and its applications among target group teachers.
- Determine the significance of difference, before and after experimentation, regarding classroom managerial skills among target group teachers.
- Determine the significance of difference, before and after experimentation, regarding change in attitude towards classroom application of educational technology among a target group teachers.
- Seek the opinion of a target group teachers on the proposed learning package and how to make it user friendly.
- Examine the significance of difference among all four regions of Swaziland regarding the effect of the proposed learning materials on target group learners.
- Compare the significance of differences between rural teachers and urban teachers in various regions as well as the whole target group.
- Assess the effectiveness of the proposed learning package for enhancing the quality of classroom communication.

Hypotheses

Major hypothesis

The proposed learning package, in the field of Educational Technology, would enhance teachers' competency to a significant level.

There were some minor hypotheses:

- There may be a significant enhancement in knowledge regarding application of Educational Technology in the classroom after experimentation, among the target teacher groups.
- There may be a significant growth in Classroom Management skills after experimentation, among the target teacher groups.
- There may be a significant difference in Attitudes towards managerial role in classroom, before and after experimentation, among the target teacher groups.
- There may be a significant difference regarding competence in application of educational technology, before and after experimentation, among target teacher groups.
- There may be a significant difference between rural area teachers and urban area teachers, before and after experimentation, regarding competency in application of educational technology.

Educational technology – its meaning and scope

The term Educational Technology refers to the use of various techniques from three major sciences: 1) Behavioural & Social sciences, 2) Management sciences, 3) Communication and Media Technologies. The chalkboard, charts, maps, figures, and modern electronic devices to display information are the outcome of various innovations and their application to the field of education. Social Sciences, which include Psychology, Sociology, and Education, tell us about individual differences among learners and their treatment. Learning rate, role of intelligence in learning, motivation, attitudes, and aptitudes are social sciences gifts which a teacher must know for an optimum learning by the students. How to manage classroom activities, cybernetics being the control of information flow in a classroom are the gifts of managerial sciences. The teacher must be a competent person to use these gifts for an optimum learning.

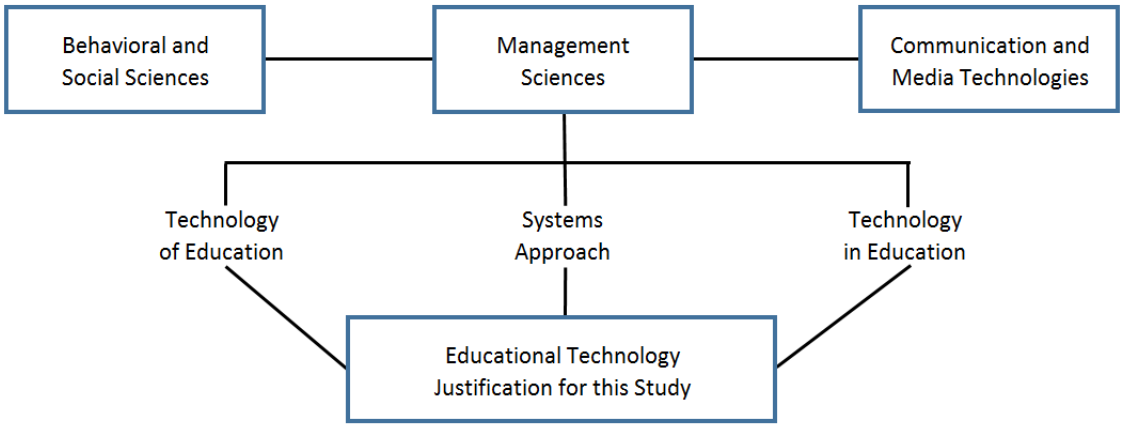

Figure 1: Scientific basis of education.

Justification for this study

The information revolution has affected every field of life. The role of a teacher is supported with different innovative ideas for using 'new machines', 'new methods' and ‘managerial techniques' in the classroom. The purpose of this new role is to enable every learner to achieve his/her optimum level. The student (as customer) and the teacher (as dealer of education) have to develop a liaison for an easy information flow between them. The managerial role of a teacher in teaching and learning, the concept of cybernetics, use of various teaching devices, learning theories, taxonomy of educational objectives, and application of learning technologies are some of the innovative options for improvement of learning. Completing the course in a prescribed time limit and meeting an objective of optimum learning for every learner is a challenge for every teacher. Also, implementing quality control norms and total quality management in a classroom are the responsibilities of every teacher. The quality in classroom communication is a matter of bridging the gap between 'perceptions' and 'expectations' from a teacher. The teachers are expected to know "An Art of Effective Communication", while it may not be in the perception. Mere covering the course content without assessing its effect on learners’ mind is the norm in most classrooms. A good quality output of classroom communication depends upon its process, which again depends upon its input. Man (the teacher) is the primary component among all five components (Man, Machine, Method, Money and Material) of every input. A skilled teacher can easily integrate all other components for managing a good quality input for effective classroom communication. Therefore, teacher orientation is essential for competency regarding a quality classroom interaction.

Methodology

This is an experimental research using a single group because it was not possible to have a two group design with an Experimental group and Controlled group.

Population and sample for this study

Table 1
Regional teacher participation during the experiment

S.No.	Region	Total Teachers		Pre-Test	Contact Session	Post-Test	Sample Selected
		Primary	Secondary				
1	Manzini	2258	1432	049	019	019	019
2	Hhohho	1910	1520	020	012	012	012
3	Shiselweni	1781	1128	049	013	013	013
4	Lubombo	1602	0924	062	023	023	023
5	Total	7551	5024	180	067	067	067

The above table 01 shows that 180 teachers participated in the Pre-test while only 67 filed their presentation during contact sessions as well as in the Post-test. This group of 67 teachers was considered as sample for this study, ignoring teachers who failed to file their presence after the pre-test in spite of reminders to them.

Learning material in Self-Instructional Material (SIM) format

Communication in the classroom is the mutual interchange of ideas by any effective means. It is desired to make this communication more effective. Therefore, it is essential that the transmission of facts or information is carried out in such a manner that use of the message and the intended meaning is clearly understood by the learners. Ludlow Ron (1996, 18-19) advocated an orientation of teachers for effective communication in classroom with students. Orientation of teachers is the process of aiding them to gain effectiveness in their present or future work through development of an appropriate competencies. These help the teacher to do his/her job correctly, effectively and conscientiously. The orientation program for teachers must include a sequence of experiences, a series of opportunities to learn, in which the trainee is exposed in some more or less systematic way to certain materials and events. It is true that every person must keep abreast of the latest developments in his field; otherwise he will soon be working far below his potential and capacities. Innovations in technology, teaching, learning and the science of management have changed the teacher-learner relationship. The teacher is now a facilitator of learning, and is no longer the primary source of ideas and information. Course content in the proposed learning package will train teachers to be effective in implementing new educational technologies in the classroom.

The package will include 16 units of self-instructional materials that include practical activities:

1. The Nature and Scope of Educational Technology.
2. Managerial Approach to Classroom Communication.
3. Systems Approach to Teaching-learning process.
4. Bloom's Taxonomy of Educational Objectives: Its utility to classroom communication.
5. Pedagogy & Andragogy in the teaching-learning process.
6. Instructional modes for classroom interaction.
7. Learning Activity.
8. Learning Theories for Classroom Communication.
9. Motivation, Interest and Emotions: Meaning and role in learning.
10. Verbal and Non-verbal Communication.
11. Role of Audio/Video aids in the teaching-learning process.
12. Role of Computers in the teaching-learning process.
13. Mastery learning for effective teaching.
14. Individual Differences among learners.
15. Assessment, Measurement and Evaluation: Meaning and utility for examinations.
16. Various types of test items and their application in examinations.

This material was distributed to all 180 participants immediately after completing the pre-test. The package provided a book in SIM format with guidelines for group discussions and a two-day contact session. This package, if found effective, would be used for staff development among all other teachers working in different schools of Swaziland.

Development and conduct of necessary tests

The research team developed three different tests. The first test was a Knowledge Test used before and after reading the proposed material. The second test was Skills Test to assess their competency/art of dealing with their students. The third test was an Attitude Scale to assess their Attitude towards teaching as a profession and classroom activities. These tests were given two times as pre-test and post-test. The pre-test was conducted in the beginning after the target group teachers had shown their willingness to participate and the post-test was administered after they completed their study through SIM, group interaction and participation in contact sessions. The analysis of the performance in pre-test and post-test revealed the effect of the proposed training package. Since all teachers have a working knowledge of English, it was presumed that they

would understand the content of the book. The research team felt that there would be no need to reproduce this material in Siswati language, the mother tongue for most of the teachers. However, they had a freedom to interact among themselves in either SiSwati or English. The research team also developed an Opinion Scale to seek target group feedback and opinions about modification of the learning package. The final outcome would be to produce a standard user-friendly learning package for staff development to be implemented in phases among all school teachers of Swaziland.

Expected impact

If the proposed package is found effective, it may raise the knowledge levels among school teachers about their role in classroom communication, equip them with many essential skills, and strengthen their positive attitudes toward a competency-based teaching-learning process. It will have its impact on Policy of the Ministry of Education which advocates for the training of teachers. The Ministry may choose to make this orientation compulsory for all school teachers. Also, it may have an impact on application of the competency gained by the target group teachers for managing classroom activities. And it will help participants to provide effective classroom communication to their students. These target group school teachers might also develop skills to meet the needs of slow learners as well as high achievers. It will result in quality interactions with the learners in the classroom, resulting in better learner performance and greater success in examinations.

Findings of this experimental research

The pre-test and post-test performances in the Achievement test , Skills test, and Attitude Scale were analysed and the results were as follows:

Table 2
Significance of difference in knowledge level (N = 67)

Statistic	Pre-Test	Post-Test	Results	Remarks
Mean	25.239	50.164	d= 24.925	t = 12.963
S.E.(Mean)	1.771	1.574	r.0.344	S(.000)

This test was of 100 marks having16 Questions of 06 marks each with 04 marks for figures/charts. The table two above revealed a difference of + 24.925 marks (out of 100 marks) between pre-test and post-test. This difference was found at S (0.000) level highly significant (t= 12.963). It indicated that the knowledge of the target group was raised significantly using the learning materials for application of Educational Technology in theclassroom.

Table 3
Significance of difference in skills level (N = 67)

Statistic	Pre-Test	Post-Test	Results	Remarks
Mean	17.15	32.06	d=14.910	t =12.282
S.E.(Mean)	1.176	0.840	r = 0.233	S(.000)

This test was of 50 marks having 08 Questions of 06 marks each with 02 marks for figures/charts. The table three revealed a difference of + 14.910 marks (out of 50 marks) between pre-test and post-test. This difference was found at S (0.000) level highly significant (t = 12.282). It indicated

that the acquired target group skills were significantly higher using the learning material. All eight skills taken above were in eight different questions.

An Attitude scale with thirty items was developed and used as pre-test as well as post-test to assess target group feelings towards Educational Technology applications in classroom. This was a 'Likert' type five point scale. There were Nineteen (19) Negative and Eleven(11) positive statements spread over five nodes/points known as " Strongly Agree"; "Agree"; "Undecided", "Disagree"; and, "Strongly Disagree" in this test.

Both type of items were amalgamated without any order to check the sincerity of the respondents during the test administration. Data obtained by using this test is Ordinal Scale data, so the Wilcoxon Signed Ranks Test, (being a Non Parametric test was used for data analysis in conjunction with the SPSS Package. There were two tables for each item. The first table compared total point's difference between pre-test and post-test and gives a rough idea about change in attitude. While, second Table covers a total of positive and negative ranks and calculates Fisher's Z value for every item. This Z value determines the significance of difference for attitude change about the particular activity. The final combined analysis throws some light on an overall change in Attitude towards using Educational Technology in classroom. Below is weightage given to both type of items.

Table 4
Significance of difference in attitude toward educational technology

Score / Item Type	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Positive	5	4	3	2	1
Negative	1	2	3	4	5

Table 5
Significance of Difference in Attitude level (N=67)

Item No.	Statements	Point Diff.	Z Value	Remarks
1	The Application of Educational Technology in classroom is wastage of time. (N)	+33	3.23	Remarkable Change
2	Classroom management will be wastage of time for us. (N)	+18	2.69	Remarkable Change
3	Systems Approach in classroom is not possible. (N)	+24	2.79	Remarkable Change
4	The Bloom's Taxonomy is backbone of whole process of education. (P)	+17	1.94	Some Change*
5	Learning concepts of Pedagogy & Andragogy will not benefit us in our work. (N)	+44	3.95	Remarkable Change
6	Various modes help us for explanation of some difficult concepts to students. (P)	+19	3.33	Remarkable Change
7	Learning theories are not related to learning activity in classroom situation. (N)	+25	2.92	Remarkable Change
8	Different Psychological variables play a vital role in learning. (P)	+16	1.75	Some Change*

Item No.	Statements	Point Diff.	Z Value	Remarks
9	The teacher has no time to study Non-verbal Communication from students in a class.(N)	+17	2.12	Remarkable Change
10	Audio-Video aids in classroom bring concept clarity among students. (P)	+24	3.09	Remarkable Change
11	Use of Educational Technology in classroom brings concept clarity among students.(P)	+20	2.71	Remarkable Change
12	The managerial approach to classroom activities will make learning comfortable among students (P)	+26	3.19	Remarkable Change
13	The students will not co-operate if systems approach are applied during classroom activities.(N)	+26	2.72	Remarkable Change
14	Bloom's Taxonomy is not applicable in practice as it may delay course completion.(N)	+29	3.09	Remarkable Change
15	Knowledge of Andragogy and Pedagogy helps us to provide learner freedom in learning.(P)	+43	4.35	Remarkable Change
16	We cannot use various instructional modes as our activities are confined to classroom only.(N)	+08	0.81	No Change**
17	Learning theories determine process of learning in classroom situation.(P)	+13	0.66	No Change**
18	Different Psychological variables have no role in learning.(N)	+36	3.86	Remarkable Change
19	Non-verbal communication from students has been found much useful to understand students' reactions to my teaching.(P)	+37	3.08	Remarkable Change
20	Using Audio-Video aids in classroom for teaching is not possible due to shortage of time and money.(N)	+01	0.48	No Change **
21	Using Computer is not possible, because students cannot operate this machine. (N)	+04	0.65	No Change **
22	Learner-Learner interaction is not possible due to limited time for classroom work (N)	+13	1.92	Some Change*
23	The computer use in classroom teaching can make students more active.(P)	+19	2.50	Remarkable Change
24	I pay no attention to non-verbal communication from students during classroom sessions. (N)	+38	3.93	Remarkable Change
25	I like that classroom session in which students listen to me silently.(N)	+25	2.76	Remarkable Change
26	I do not believe in developing new innovative strategies of teaching. (N)	+18	2.85	Remarkable Change
27	Those students who do not understand even during classroom teaching, should leave the studies(N)	+19	2.62	Remarkable Change
28	The concept of Mastery learning is not applicable in classroom situation. (N)	+37	4.01	Remarkable Change
29	The teacher has to do nothing with an idea of Individual Differences among students (N)	+23	2.80	Remarkable Change
30	The teacher has to take care of weak students being slow learners. (P)	+16	1.51	Some Change *

As per Table 5, there were 11 positive statements and 19 negative statements. The pre-test and post-test performance was subjected to a point difference analysis as well as Wilcoxon Z test. This test was used because the attitude data was Ordinal scale data. It revealed that in 22 items there was a remarkable change while in 04 items there was some change. Also, there were 04 items where there was no change found after analysis.

Table 6
Total shift in Group Attitude

Range / Test Stage	30 - 53	54-77	78-101	102 -125	126-150	Remarks
Pre- Test	00	00	13	32	22	Overall shift in Attitude was Positive (N= 67)
Post – Test	00	00	00	28	39	17 (25%) Teachers jumped to Highest level after study
Difference	00	00	-13	-04	+ 17	13 (20%) Teachers jumped to Higher level after study

Table 5 is an overall analysis and indicates that 13 (19.40%) teachers shifted from normal group to higher groups after the posttest. Also, there were 17 (25.37 %) more teachers in highest group after the post-test. It indicates that a significant change in overall attitude was witnessed after the experiment.

Table 7
Overall opinion about book "Educational technology for Effective Teaching"

Sr.No.	Response	Frequency	Percentage	Cumulative Percentage	Results (N=67)
1	High opinion (60-80)	51	76.1	100	Only 1(1.5%) had a low opinion while 66 (98.5%) had a favourable opinion of the book.
2	Normal opinion(38-59)	15	22.4	23.9	
3	Low opinion(16-37)	01	1.5	1.5	

An overall analysis as stated in table 6 above indicated that 51(76.1%) participants had a high opinion in favour of the Book "Educational technology for Effective Teaching" while 15 (22.4%) had a normal opinion for the same. Only one (1.5%) had a low opinion in comparison with others.

Analysis of results

Major objective

"To develop and try out a training package in the field of Educational Technology for staff development among school teachers through distance education mode."

This objective was fully achieved as the project team had developed the training package and assessed its effectiveness among 67 school teachers of Swaziland.

Specific objectives

To determine the significance of difference before and after experimentation regarding knowledge level about Educational Technology and its applications among target group teachers.

This objective was fully achieved by using the Training Package. The knowledge level of the participants regarding educational technology was changed significantly as shown in Table 2.

To determine significance of difference before and after experimentation regarding classroom managerial skills among target group teachers.

This objective was also fully achieved by using the Training Package. The Knowledge level of the participants regarding Educational Technology was changed significantly as shown in Table 3.

To determine significance of difference before and after experimentation regarding change in attitude towards Educational Technology application in classroom among target group teachers.

Table 5 is evidence that there was some change regarding item numbers 4, 8, 22 & 30. But item numbers 16, 17, 20, 21 had no significant change in attitude of the participants. In the remaining 22 items there was a significant change observed after post-test.

To seek opinion of target group teachers on proposed Learning package to make it user friendly.

This objective was fully achieved by using Opinion Scale.

To examine the significance of difference among all four regions of Swaziland regarding the effect of learning material on target group learners.

This objective was left out for analysis due to small number of participation (N= 67).

To compare the significance of difference between rural teachers and urban teachers in various regions as well as the whole target group.

This objective was also left out for analysis due to small number of participation (N= 67).

To assess the effectiveness of proposed learning package for enhancing quality of classroom communication.

Due to prescribed time frame of one year, this objective could not be considered for analysis.

Hypothesis result analysis

Major hypothesis

"The proposed learning package, in the field of Educational Technology would enhance teachers' competency up to a significant level".

This major Hypothesis was accepted as it was evident from the results.

Minor hypotheses

There may be a significant enhancement in the Knowledge level regarding Educational Technology application in the classroom after experimentation among target group teachers.

This minor hypothesis was verified and accepted on the basis of results shown in Table 2.

There may be a significant up gradation about classroom Managerial Skills, among the target group teachers, after experimentation.

This minor hypothesis was verified and accepted on the basis of results shown in Table 3.

There may be a significant difference before & after experimentation in Attitudes towards managerial role in classroom among the target group teachers.

This minor hypothesis was verified and accepted on the basis of results shown in Table 5.

There may be a significant difference before and after experimentation regarding educational technology application competency among target group teachers.

This minor hypothesis was not verified due to 01 year limited time frame for project completion.

There may be a significant difference between rural area teachers and urban area teachers regarding educational technology application competency before and after experimentation.

This minor hypothesis could not be verified due to inadequate representation from rural and urban areas.

Future plan of action

This experimental research project is a pilot study to see the effectiveness of a training package to be used through distance mode for raising competency among school teachers regarding classroom activities management to achieve the target of optimum learning. If this package is found effective and user-friendly in its purpose, it may be used to train all school teachers of Swaziland. There are about 7551 primary teachers and 5024 secondary teachers working in 575 primary schools and 227 high/secondary schools of rural and urban areas of Swaziland. This target group will be trained with the help of 67 teachers who have been trained in this project using distance Education mode. These 67 teachers will also work as a link between target population teachers and the Institute of Distance Education, University of Swaziland, for Staff Development through distance mode if necessary financial provision is made available for the same.

References

Davies, I. K. (1971), "Management of Learning", McGraw Hill Inc., USA, pp. 5-11.

Ludlow R. (1996)-"The Essence of Effective Communication" Prentice Hall of India, Pvt. Ltd., New Delhi. pp 18-19

Ministry of Education(2008) –"The Development of Education, National Report of the Ministry of Education, Swaziland, Kingdom of Swaziland, www. ibe. unesco.org/National_reports/ICE_2008/Swaziland_NR 08 PDF pp16-17

Stephen I Stephen I & William B., Handbook in Research and Evaluation Ed. IIS, San Diego, California, USA (3rd ed. p 201)

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