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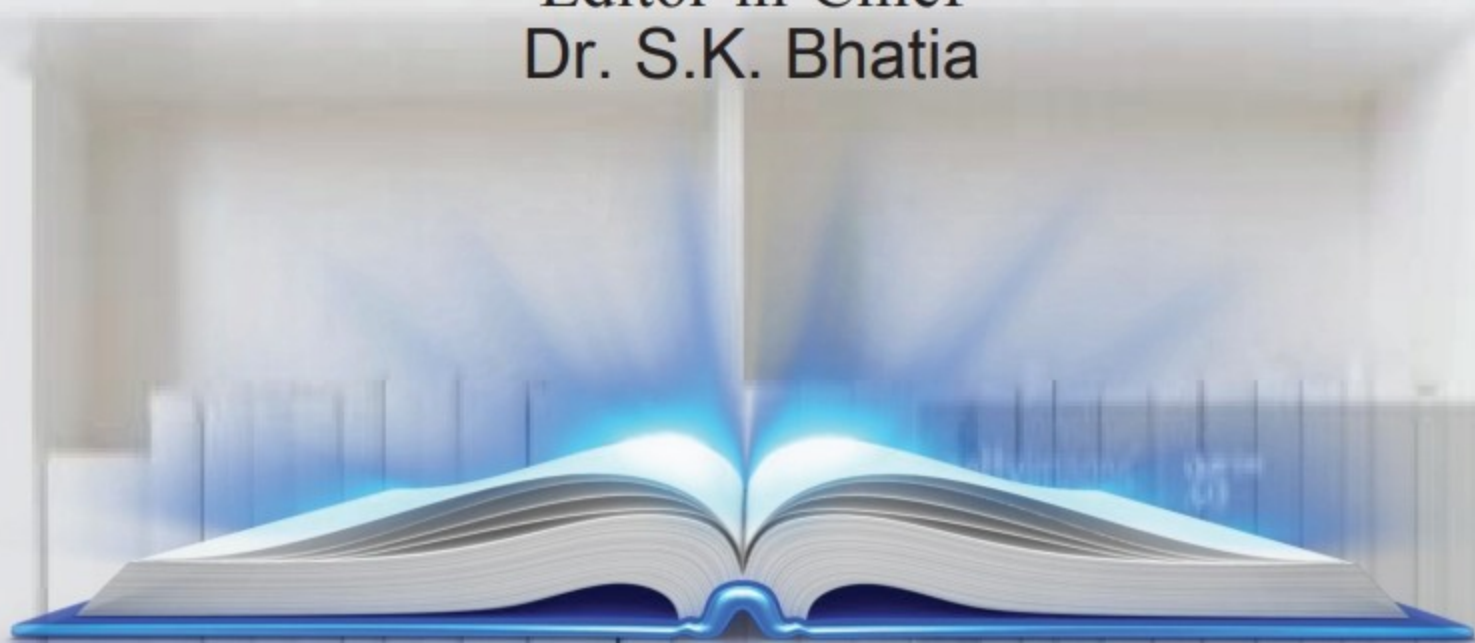
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**Editor-in-Chief
Dr. S.K. Bhatia**



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Bi-Annual Journal

Would like to appeal to the learned readers to send us their views, counter views, suggestions, comments, and observations etc. via “Letters to Editor” (which will be published in the next Issue) on the articles published in this Journal so that an academic discussion may start and our efforts may become more participative and thereby more meaningful and interesting.

Editor-in-Chief

The Themes for the next Issue January-2026

Section I.

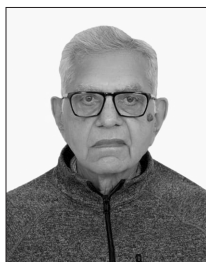
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2. Changes in perspectives on areas of research in Teacher Education.
3. Perspectives on how learning in Curriculum and Pedagogy are demonstrated in Teacher Certification Programs.
4. Perspectives on effective Evaluation Practices in Teacher Education Programs.
5. Innovations and Innovative practices in Teacher Education Programs.
6. Diversity and Inclusion: Different International perspectives.
7. Ensuring access and equity in high quality Teacher Education programs.
8. ICT-related Innovations and practices in Teacher Education Programs.
9. Policy Perspectives in Teacher and School Education.
10. Reports on related conferences, seminars and workshops, including International offerings.
11. The Prolonged Online Mode of Teaching-learning - Challenges, Innovative experiments, Findings.
12. Tailored Interventions in Learner-centered Education.
13. Blended Learning as an outcome of Online Learning during the ongoing pandemic.
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1. Teachers’ Professional Growth
2. Optimising Students’ Achievement
3. Holistic Learning
4. Experiments in the area of Experiential Learning.
5. Objective Evaluative Strategies During the Prolonged Closure of schools.
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8. Literacy and Numeracy Challenges and their Remedies in schools
9. Integrating the inputs of Arts, Music and Play during the classroom teaching-learning processes
10. Starting Job-linked Courses in Schools at the Secondary Level

Thanks and Regards
Editor-in-Chief
Dr. S.K. Bhatia

Editorial



It gives me great pleasure to present the July 25 issue of our journal to our valued subscribers, esteemed reviewers, respected members of the advisory board, and all others who take an active interest in the field of teacher and school education. The process of preparing a new issue begins almost immediately after the previous one is finalized. During this time, we begin identifying potential themes for the upcoming edition—topics that typically reflect current trends, challenges, and innovations in teacher education and school systems both locally and globally.

Our contributing authors remain closely attuned to educational developments within their own countries while also engaging with broader academic discourse worldwide. Some contributors focus specifically on their areas of interest or the results of their ongoing research, resulting in thoughtful and original articles. While the primary criterion for accepting submissions remains the academic quality and relevance of the work, we also strive to support emerging scholars by providing space for new voices. As such, if some articles seem slightly less refined, we encourage readers to view them as part of our effort to nurture early-career researchers and foster a diverse scholarly community.

It has been clearly stated that the themes outlined in the opening pages are merely indicative, and authors are encouraged to reflect on the unique circumstances within their own countries. Accordingly, they may choose themes relevant to teacher education and school education that address pressing national and regional issues. For instance, some nations are grappling with the devastating consequences of wars and terrorism. Others are witnessing rapid, often unchecked developments in artificial intelligence, while in many places, large segments of the population still live below the poverty line. Education can and must play a transformative role in addressing these challenges. It would be both timely and valuable for contributors to explore these issues in depth and engage in research aimed at practical solutions. Rather than investing in unproductive or harmful ventures, efforts should be directed toward making our planet a more peaceful and liveable place through informed educational practices. The journal will gladly consider and welcome papers that focus on such critical and solution-oriented themes.

It is well recognized that scholarly papers produced by teacher educators serve a dual purpose: they contribute meaningfully to the advancement of teacher education and simultaneously enhance the quality of school education. Similarly, the projects initiated within schools, as well as articles and papers authored by school teachers, have the potential to significantly benefit both domains. While teacher educators continue to make substantial contributions to academic literature, submissions from schoolteachers remain disproportionately limited.

This disparity is not due to a lack of innovation at the school level. On the contrary, school teachers frequently experiment with pedagogical practices, actively engage in co-curricular activities, and lead student teams in various academic and cultural competitions. However, what is often lacking is institutional support to help them document and publish their academic innovations and extracurricular achievements.

To bridge this gap, we are reaching out to principals of reputed schools across various countries, encouraging them to motivate their staff to contribute to academic discourse. It is our sincere hope that, in the near

future, both sections of our journal—those dedicated to school education and to teacher education—will be enriched by a more balanced representation of contributions from schools and teacher education institutions alike.

As we move forward, our commitment remains firm: to provide a vibrant, inclusive platform that reflects the dynamic realities of teacher education and school practice around the world. We believe that education, at its best, is a collaborative endeavor—one that flourishes when educators across different contexts share their insights, experiences, and innovations. We encourage all our readers—whether teacher educators, school leaders, classroom teachers, or policy advocates—to engage with the work presented here, to respond, to critique, and above all, to contribute. Together, we can continue to build a global community of practice that not only reflects but also shapes the future of education. We thank you for your continued support and look forward to your active participation in the issues ahead.

Dr. S. K. Bhatia
Editor-in-Chief

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RESEARCH ARTICLES

Teacher Preparation for Secondary Education in Ethiopia: Assessment of the Implementation of Post-Graduate Diploma In Teaching (PGDT) Program in Public Universities

Ashenafi Tsegaye Tegegn

Abstract

This study was conducted to assess the design and the implementation of Postgraduate Diploma in Teaching (PGDT) program in three public universities. Mixed methods research approach was used to address the research questions. Data was collected through interviews, questionnaires, observations and document review; and analyzed using narrative and statistical techniques. Findings of the study show that PGDT, like its predecessors, was benchmarked on the foreign practice (i.e., the UK and South African teacher preparation systems); it was introduced to address limitations found with previous programs; the implementation of PGDT was not as intended to be and affected by different factors, like anomalies in candidate selection and admission and in course preparation, delivery and assessment; scarcity of resources and facilities; lack of interest in the program on the part of universities' management, teacher educators and candidates; absence of strong follow-up; and lack of collaboration among key stakeholders.

Keywords: Curriculum, Curriculum Implementation, Mixed Method Research, PGDT, Secondary Education, Teacher Education, Teacher Preparation Program, the Concurrent Model, the Consecutive Model

Introduction and Background

Teacher education has been regarded as a key target and lever of educational reform (Cochran-Smith & Zeichner, 2005; Rao & Rao, 2005); the bedrock for national development (Ogunyinka, Okeke & Adedoyin, 2015). It is a teacher education program that takes a lion share to translate the needed skill, knowledge and attitudes to meet societal needs; to produce well qualified professionals in all aspects of sects; and to produce good teachers for all school levels (Ogunyinka et al, 2015). In general, teacher education is highly interlocked with national development, and the role of teachers in making sustainable development is unquestionable because teacher is a responsible person on translating educational policy into practical action.

The concept *teacher education*, though conceived from different vantage of points, is usually viewed as the process of professional preparation of both prospective and in-service teachers towards the attainment of competencies and skills considered desirable so as to make them efficient and effective in their teaching (Feuer et al., 2013; Zogla, 2009; UNESCO, 2002 & 1990; Osuji, 2009). In broader sense, teacher education includes training occurring before commencement of service and during service, which is designed to equip teachers with the knowledge, skills, attitude and behaviors required to discharge their professional responsibilities and roles effectively.

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Different modalities of teacher education have been used across the world. The most common models are the *concurrent* and the *consecutive* models of teacher education (Musset, 2010; Terhart, 2003). In the concurrent modality, candidates simultaneously study both the subject-specific courses and pedagogical courses (Tehart, 2003). It has been used in countries like China, Korea, Taiwan, USA, Japan, Singapore, UK, etc. whereas, the consecutive modality, also known as the *Sequential model*, or the ‘*Add-on*’ model, is applicable on the applicants who already have bachelor degree in relevant subject area, and then study for further period to gain an additional qualification in teaching. It focuses on the *how* of teaching knowledge and pedagogical skills, not the *what* to teach and consists of both formal instruction and supervised practice (Aklilu, Alemayehu & Mekasha, 2008).

As Musset (2010) posited, the advantages of organizing teacher education program on the basis of the *concurrent model* lie in that it allows a more integrated learning experience (or it provides opportunities to integrate theory with school practice) for pedagogical training, and subject-matter training take place at the same time; enables candidates know their professional destiny from the outset; and yields sustained commitment to excellence in teaching.

On the other hand, one of the merits of the *consecutive modality* of teacher education is that it allows a flexible entry in to teacher education, or it provides opportunity for those who want to join the teaching profession (Musset, 2010; Tesfaye, 2008). To this contrast, this modality has limitations like: time consuming, little consideration to school content knowledge, lack of integration of content and pedagogical knowledge and so forth as compared with concurrent modality (Aklilu et al, 2008; Tesfaye, 2008).

Teacher education has entertained a number of arguments and debates in its long history. The outstanding contentious issues include, among other things, the nature and kind of teacher education curriculum components; the way the curriculum is prepared and delivered; the recruitment and admission of candidates; training loads for the candidates; the nature and organization of practicum courses; student assessment and evaluation methods; accreditation and certification procedures; the criteria used to measure graduate competences or to evaluate the outcomes of teacher education programs; teacher licensure requirements; the issue of maintaining a balance between subject-matter courses and professional/pedagogical courses in the training program; the proportion of and the nexus between theory and practice; and program modalities (Ahmed, 2013; CEBS/AAU, 2013; Menter, 2010; Aklilu et al, 2008).

There is an almost universal quest for greater teacher quality, and with it, a demand for high quality teacher education (Townsend & Bates, 2007). Nonetheless, barriers to ensuring quality in teacher education and of teachers are many. Some of the common problems hindering success in teacher education in the world at large are insufficient teacher remuneration, shortage of high quality applicants, poor subject-matter knowledge, poor pedagogical preparations, disconnecting theory and teaching practice, poor command of the medium of instruction, limited professional preparation of teacher educators, loose quality assurance practices, and failure to bring about favorable attitude towards the profession (UNESCO, 2013; Darling-Hammond, 2006; Aklilu et al., 2008).

Review of literature indicate that best practice teacher education programs require best practice systems for selecting, preparing and inducting teachers into the profession. Best practice principles for teacher education must consider more than the content and organization of university courses. By implication, successful preparation of a high-quality teaching workforce depends on close attention to, and the alignment of, all elements of a country’s teacher preparation *system*.

Darling-Hammond (2006a, 2006b) provides the following synthesis of best practice principles for teacher education programs. Well-designed programs have:

- *Coherence*, based on a common, clear vision of good teaching grounded in an understanding of learning, permeates all coursework and clinical experiences;
- A *strong core curriculum*, taught in the context of practice, grounded in knowledge of child and adolescent development, learning in social and cultural contexts, curriculum, assessment and subject-matter pedagogy;
- *Extensive, connected clinical experiences* that are carefully developed to support the ideas and practices presented in simultaneous, closely interwoven course work;
- *Well-defined standards of professional knowledge and practice* are used to guide and evaluate course work and clinical work;
- *Explicit strategies* that help students (1) confront their own deep-seated beliefs and assumptions about learning and students and (2) learn about the experiences of people different from themselves;
- *An inquiry approach that connects theory and practice*, including regular use of case methods, analyses of teaching, and learning, and teacher research applying learning to real problems of practice and developing teachers as reflective practitioners;
- *Strong school-university partnerships* that develop common knowledge and shared beliefs among school- and university-based faculty, allowing candidates to learn to teach in professional communities modelling state-of-the-art practice for diverse learners and collegial learning for adults; and
- *Assessment based on professional standards* that evaluates teaching through demonstration of critical skills and abilities using performance assessments and portfolios that support the development of ‘adaptive expertise.’

These best practice principles can provide a sound basis on which to benchmark Ethiopian teacher education programs.

An Overview of the Ethiopian Teacher Education

Ethiopia is the second most populous country in Africa next to Nigeria with a total population of over 120 million (UNESCO, 2015) with diverse languages, culture and topography. The country has a total area of 1.12 million square meters. Agriculture is the main economic basis of the country, engaging about 80% of the total population and contributes about 50% to the GDP. Politically, the country adopted a federal system of governance with 12 regional states and two city- administrations.

Secondary teacher education in the country was systematically initiated in the beginning of the sixties, with the establishment of the Faculty of Education of the Addis Ababa University, the then Haileselassie I University (HSIU), in 1962 (Teklehaymanot, 2000). The mission, the structure or the modality (*concurrent vs. consecutive*), the curriculum (the degree of course mix between subject matter and pedagogy) and the implementation of secondary teacher education had always been a fiercely contested terrain ever since the inception of teacher education in the country (Aweke, Eyasu, Kassa, Mulugeta, & Yenealem, 2017; Nasir &

Kedir, 2011; COE/AAU, 2008 & 2013; Teklehaimanot, 2000). As to the report of different policy documents and studies (TESO, 2003; Aklilu et al, 2008; Ambissa et al., 2008; Solomon, 2007; AAU/CEBS, 2008 & 2013), the insufficiency of secondary teachers' professional knowledge and skills, and a decline in their professional value and morale are serious problems inherent with the Ethiopian teacher education system.

Generally speaking, teacher education in the country has long been suffered from a plethora of problems. Key issues facing teacher preparation and development in Ethiopia are unfavorable attitude toward the profession, scarcity of educational resources, shortage of high quality applicant, insufficiency of teachers' subject-matter knowledge and pedagogical skills, insufficient teacher remuneration, contradictions and inconsistencies in policy and practice, poor curriculum organization (COE/AAU, 2008 & 2013; Nasir & Kedir, 2011; Solomon, 2008; Kedir, 2006; ETP, 1994; MOE, 2003).

The policy framework for current teacher education

According to existing literature, teacher education reforms made by current Ethiopian government can be categorized as Pre-TESO (1991-2002), TESO (2003-2009) and Post-TESO (2010 onwards). The ensuing paragraphs present the backgrounds, developments and associated issues on each of these reforms.

The 1994 ETP

The 1994 education and training policy (ETP) provides policy context for teacher preparation and development initiatives in the country for that teacher education program has been one of its key priority areas. ETP's statements reveal that the central concern of teacher education program is producing competent teachers for schools; and preparation of curriculum, based on relevant standard and sound pedagogical and psychological principles, has also been one of the objectives of the policy.

In line with the guidance of the policy, the MOE adopted the Teacher Development Blue Print in 2007, a strategy guideline providing framework for teacher development initiatives. As articulated in this blue print the Ethiopian teacher education envisions seeing school teachers who are capable of producing responsible and competent citizens, committed to their profession and ready to lifelong learning, and who respect and behave in accordance with the democratic principles enshrined in the Constitution. The teacher development blue print document provides an overall guidance on the selection, training and management of teachers.

Though there was no comprehensive policy of teacher education, the 1994 ETP introduced several new initiatives, such as the four ESDPs, TDP, GEQIP, and other related reforms descended, and opened up reasonable room for teacher preparation and development.

Ethiopian Teacher education before TESO, 1994-2003

In the pre-TESO PERIOD, the education sector had developed and implemented multi-year Educational Sector Development Program (ESDP) as of 1997/98, whose main thrusts were to expand access, improve quality, relevance, efficiency and equity. Accordingly, ESDP-1 was designed in 1997 for all levels of teacher education program to benefit students, teachers, teacher educators, educational leaders and implementing technical staff. It aimed at improving teacher educators' knowledge, skills, and attitudes.

Ethiopian Teacher education during TESO, 2003-2009

In 2003, the Ethiopian government launched a reform known as Teacher Education System Overhaul (TESO) as a move against multiple drawbacks found with the previous teacher education practices like teacher's lack of teaching competence, absence of a link between what teacher educators do and what schools do (educators didn't know the school situation), teacher-centeredness of the instructional process or minimal attention to active and reflective teaching, inadequate emphasis to practicum and action research, absence of community participation in schools activities (MOE, 2003). As such, the new program was regarded as a paradigm shift in the subsector and essentially focused on recruitment and admission procedures of candidates; student-centered learning or active and reflective pedagogy; practice-oriented and skill-based training; integration of pedagogical training with the subject matter; and self-preparedness for the teaching profession (Ahmed, 2013; Aklilu et al, 2008; MOE, 2003). By doing so, TESO aimed at creating professional who would be competent in subject-matter knowledge and method of teaching or teachers equipped with pedagogical content knowledge (PCK), classroom management, values and ethics essential to professionalism (MOE, 2003).

On top of this, emphasis was also given to professional competence. TESO program includes changes like reduction of study year (reduction of a 4-year program to a 3-year program); introduction of practicum program throughout 3 years training; offering of action research courses that fosters problem-solving skill of the student-teachers; and paradigm shift from traditional teacher-centered approach to student-centered approach (Aklilu et al, 2008).

The same year, MOE launched TDP-1, a program that was planned to extend from 2003/4 through 2007/2008 and charged with supporting the reform of several portions of the teacher education system. These areas included the improvement of the quality of teacher educators at teacher education institutions (TEIs), both universities and colleges of teacher education (CTEs), the development of pre-service, particularly in the areas of practicum and selection, as well as in-service teacher professional development activities. In addition, TDP-I supported the system of teacher education, training for school leaders and management, and the quality of English language teaching and pedagogy.

Structure wise, teacher education was based on the concurrent modality whereby candidates simultaneously studied both the subject-specific courses and pedagogical courses. TESO had two components: *the pre-service teacher-training* sub-component and the *in-service teacher-training* sub-component.

Different studies and reviews conducted on the TESO program (e.g., COE/AAU, 2008 and 2013; Dawit, 2008; Temecheegn, 2007) show that the program had considerable strengths and brought remarkable achievements, for instance, it was appreciated for its relevant curriculum that had given due emphasis to practicum and action research courses; for its embodiments of foundation courses, pedagogical courses, and subject area teaching courses; and for its establishment of the culture of a strong university-school partnership.

Nevertheless, it was reported that there was weak alignment between the teacher education curriculum at universities and the school curriculum (Solomon, 2008). That is to say, a considerable number of teachers who were teaching in secondary schools were not trained in line with the TESO intentions. Thus, there was a gap between the TESO discourse and the practice in the teacher training institutions.

Owing to the inherent limitations and some dissatisfaction in the content competencies of the TESO graduates and the TESO curriculum (embodiment of much pedagogical courses) in general, the MOE launched, in 2009, a new approach for the training of secondary teachers, the PGDT program.

Ethiopian Teacher education after TESO: the PGDT, since 2010

As the national curriculum framework (MOE, 2009) states, the rationale for launching the PGDT program relates to problems associated with previous teacher education programs (TESO/TDP program), especially continuing teacher quality problems that had been perennial to the Ethiopian secondary schools; and the government's needs to reorient the teacher education system, particularly increasing interest in the Pragmatist and the reflective models of teacher education as effective ways of developing teachers' competencies, skills, and attitudes. These are justified by the government as a driving force to make the shift in the model of teacher education. Other way, reasons for launching the PGDT program include inadequate teachers' subject-matter competence; lack of proper and sufficient implementation of active learning methods in schools; lack of demonstration of professional commitment and work ethics to the desired degree; low interest of teachers to follow up and assist students; and poor school-community relations.

PGDT, the sequential, also known as the 'add-on' model of teacher training for secondary teacher education, is a system where teacher candidates with undergraduate degrees in any subject that directly relates to secondary school subjects apply for more training in teacher education to become professional teachers (MOE, 2009). Moreover, PGDT is designed for those in-service teacher trainees who upgrading from diploma to degree program.

Initially, PGDT program was supposed to be implement in regular program consisting of three terms. However, by 2011, it turned out to be a summer modality because of the fact that regional education bureaus faced shortage of teachers and absence of graduates with first degree in teaching.

Admission Criteria to the PGDT

- B.Sc. or BA in areas directly related to secondary school subjects,
- Interview and entrance examination to assess:
 - students' readiness, predisposition, and motivation to become secondary school teachers.
 - students' language and communication skills
 - any previous engagement with children or schools.
- Teaching profession ethical standards will be considered during selection (MOE, 2009).

Nonetheless, some studies in the area (e.g., Koye, 2014 & Aweke, 2015) disclose that there was admission discrepancies in the practices of universities.

Courses taught in PGDT Program

PGDT training curriculum has five types of course or modules: *foundation courses, professional courses, subject-area teaching courses, Action research and practicum* (MOE, 2009).

Management of PGDT

Implementation of the PGDT has been involving different stakeholders, such as the MOE, regional education bureaus, sub-cities, zonal and district education offices, and secondary schools. The program is centrally coordinated by the MOE and each PGDT offering university has one PGDT coordinator who coordinates both the management and resources to the program (MOE, 2009).

Research on the implementation of the PGDT program and its perceived impacts was scant. That is, no comprehensive study was conducted on the design, development, implementation and results of the program, and this was the inspiration for this study.

The Education Development Roadmap of 2018-2030

Very recently, the Ethiopian federal government promulgated the Education Development Roadmap (2018-2030) to address the shortcomings of the 1994 ETP as related to teacher preparation and development, such as gaps in policy and strategy; discrepancies or irregularities in policy implementation; difficulties with teacher training modalities; problems in the qualification, deployment and performance of teachers; issues concerning incentive and support for teachers; teacher licensing and re-licensing; provisions for advancement, transfer and retention; and challenges related to CPD and teacher upgrading (MOE, 2018).

Statement of the Problem

Though PGDT has been implemented by ten universities for a decade, a comprehensive study on the various aspects of the program was a rare practice in the Ethiopian universities. Thus, paucity of studies on the design, implementation and outcomes of PGDT, and thus, absence of empirical evidence that could provide readers with a big picture if the issue was what triggered the interest of this researcher.

In order to address the research problem, the following four overarching basic questions were formulated and studied in detail at the three institutions:

1. How was PGDT designed and developed? Who did take part in the process?
2. How was PGDT implemented in the universities?
3. What factors affected the implementation of PGDT?
4. What are the impacts of the program on the trainees and the graduates?

This study, thus, attempted to answer the stated basic research questions and their components by exploring the perspectives of the designers, the implementers and of those teachers who had taken the training and employed.

Objectives of the Study

The objectives of this studies were to:

- Explore how PGDT was designed and developed, and who involved in the process,
- Examine the implementation process, that is, how the program/training was run in the universities,

- Investigate factors affected the implementation process,
- highlight the influences of the program on the graduates,
- Provide some suggestions that would inform secondary teacher education policy and practice and set agendas for future research.

Significance of the Study

The findings of this study can have significance to the field of teacher education in different ways. It provides theoretical and empirical evidences that would inform policy-makers, curriculum developers, implementers and teacher education researchers. It can also serve as a source of information for those who would like to join the teaching profession and understand teacher education system in the country.

Research Methodology

This study adopted the mixed methods approach, based on two assumptions. First, studying the development, implementation and impacts of the PGDT program is a complex and multifaceted process that can involve the collection and analysis of both qualitative and quantitative data from diverse sources by using a blend of instruments and techniques. Second, employing the mixed-methods approach was found helpful to generate broader understanding of the educational practices under study.

Moreover, this study employed the case study design. The case study design is a strategy used to investigate a bounded and a particular unit of a study (a case) to understand its complexity and/ or the broader context in which it is situated (Kridel, 2010; Yin, 2003; Bassey, 1999; Merriam, 1998; Stake, 1995). In the same vein, Hays (2004) points out that a case study design is a good fit to answer focused questions by producing in-depth descriptions and interpretations over a relatively short period of time as well as investigate contemporary cases for purposes of illumination and understanding. As the main intent of this study was exploring the state-of-the art of PGDT program in three universities (bounded systems), the case study design was found to be appropriate design to use.

Selection of the Research Settings

Secondary teacher education has been offered in the universities. Out of 10 universities that were selected to offer a 1 year degree professional training in teaching (PGDT), three universities (AAU, BDU, and JU) were randomly selected as research settings. Once the universities were selected, this researcher directly contacted with the Colleges of Education hosting PGDT program, and selected research participants, especially those who were taking part in the design and implementation of the program.

Addis Ababa University (AAU), the first higher education institution, established in the 1950s, has a long tradition in providing teacher education and in designing its curriculum. Furthermore, it was the major (until 1980s) provider of secondary school teacher education in Ethiopia. AAU was selected by the Ministry of Education to be one of the ten national universities that were capable to run PGDT.

Bahir Dar University is located in the town of Bahir Dar, the capital of the Amhara National Regional State, in the north-western Ethiopia. BDU is relatively one of the oldest universities in Ethiopia, founded in 2000

following the merger of two sister institutions: Bahir Dar Polytechnic Institute, founded in 1962 and Bahir Dar Teachers' College launched in 1972.

Jimma University is one of the largest and comprehensive public universities in the country. The origin of JU dates back to 1952 when Jimma College of Agriculture was founded. The University got its current name in 1999 following the merger of Jimma College of Agriculture and Jimma Institute of Health Sciences, founded in 1983.

In addition to the three universities, some secondary schools were also research settings for collecting feedbacks from teachers who had taken the PGDT training and working in different schools. So, this researcher made contacts with three regional education bureaus where the sample universities located (i.e., Oromia, Amhara, and Addis Ababa City Administration education bureaus), and certain graduates of the PGDT were working.

Selection of Research Participants

The research participants were educational workers serving at different levels on PGDT program: 21 teacher-educators and 3 coordinators of PGDT program at three universities, and 152 student-teachers at the universities studied; 3 experts of pre-service secondary teacher education program at the MOE; 25 PGDT graduates; 3 regional education bureau experts, and 30 school directors. 152 PGDT trainees, out of 528, were selected from three universities by using probability sampling techniques, while the rest research participants were selected purposely based on their role, responsibility and experience in the design and implementation of the PGDT, and on their willingness to participate in the study. Overall, a total of 235 participants were included in the study as data sources.

Data Collection Techniques and Instruments

A blend of data collection techniques and instruments, such as interview guides, questionnaires, classroom observation checklists as well as document review or desk-reviews were used to collect the required data.

Interview guides were prepared to collect data from 21 teacher-educators, 3 coordinators of PGDT program at three universities, 3 experts of pre-service secondary teacher education program at the MOE; 25 PGDT graduates; 3 regional education bureau experts, and 30 school directors. An interview guide that contained 9 questions and their sub questions was designed and used in the interview conducted with for three experts of the MOE, 3 regional education bureau experts, and 30 school directors; an interview guide that contained 10 questions was designed for teacher educators in the three universities; and an interview guide that contained 10 questions about the management of PGT was constructed for the coordinators of PGDT in the universities.

In this study, two sets of structured questionnaires were developed to collect quantitative and some qualitative data from the PGDT trainees and PGDT graduates. The questionnaires consisted of both close ended and open-ended questions, and the contents are aligned to the themes of the interview guideline. The close-ended questions questionnaire that was devised to collect data from the trainee-teachers contained 7 questions and their sub-questions. It aimed at measuring trainee-teachers' attitudes towards the overall aspects of the PGDT training. such as the nature of support system by the university leadership, the overall characteristics of the teacher-educators as well as the behaviors of the trainees, implementation of practicum and Action research, the nature of the courses and the training time.

Observation checklists prepared to collect data from 21 teacher-educators. It consisted of items related to teachers' instructional activities, students' learning activities as well as classroom setup. Data collection through observation involved pre-observation discussion and post-observation reflection with the teachers who taught different PGDT courses.

When it comes to the second questionnaire devised to collect feedback from the completers of the training, it consisted of 9 main questions about the overall nature of the training and their level of satisfaction with it and teaching job.

In addition to the mentioned instruments of data collection, relevant documents pertinent to the secondary teacher education were obtained and analyzed. The documents include education policy statements, proclamations, annual statistical abstracts, national curriculum frameworks, syllabi, and course modules. The document review was conducted to reveal information/data on the objectives of secondary teacher education and the very essence of the PGDT program and its curricula. Thus, the document review aimed at enriching and enhancing results obtained through interviews, and triangulate results with interview and classroom observations.

The document review was done by thematic content analysis method. For this purpose, some themes, such as purposes or objectives, contents, structure or organization of the syllabi and the courses/modules were considered as frame of references.

Data Collection Procedures

The data collection process, which lasted for seven months, involved different activities, such as developing a research protocol and establishing a rapport with the three university hosting PGDT and the research participants selected for the study, obtaining consent, and then collecting the data step-by-step. The interviews were conducted on a one-to-one conversation. Questionnaires were administered to the respondents on spot. Classroom observations were also conducted with 21 teacher educators who were offering different PGDT courses.

Data Analysis Techniques and Procedures

The data of this study were transcriptions from the interviews, statistics from the questionnaires, and notes of classroom observations and document review or desk-review. Qualitative data collected through interviews were transcribed, coded and interpreted thematically using vignettes and texts or narrations. The data collected through questionnaire were also coded, entered, cleaned and analyzed statistically using the SPSS 20 computer software. That is, the quantitative data was reduced into descriptive statistics and inferential statistics, such as correlations, t-tests, and one-way ANOVA while responses for the open-ended questions were analyzed using narrations. The thematic approach was followed to display the analyses and findings from all data.

The data collected from the three universities was analyzed in two phases. In phase one, data collected from each university was analyzed separately. In phase two, inter-universities analysis was made, or the implementation processes of the three universities were compared and contrasted against the major themes created. This technique aimed to see similarities and differences in practice of the three institutions, and then draw conclusions.

Summary, Conclusions and Implications of the Study

Summary of the Findings

This study aimed at examining the design and execution of PGDT at three public universities. Both desk review and field survey were conducted to obtain data. Summary of the findings obtained from all data are integrated and presented under key areas that represent the basic research questions formulated.

The design and development of PGDT

With the federal government initiative, PGDT program was designed by a taskforce, which was composed of representatives from old universities, and senior experts working in the ministry of education. The task force used the experiences of UK and South Africa (of the Cambridge University and of the University of South Africa) in benchmarking PGDT.

The implementation of PGDT

Data obtained from the interview, questionnaire, observation and document review disclosed that

- There was absence of strong and consistent candidate recruitment and admission policies. Admission discrepancies is noticeable in the system, that is, candidates were selected in two ways, mainly by the MOE and sometimes at the university level and even different from university to university. The selection system also led to the discontent of the hosting university or problem of ownership of the program.
- The implementation of PGDT was characterized by inconsistencies and irregularities as it was run during regular time at the initial years, and then during summer season one time, and during winter season other time and the vice-versa. Thus, the In-Out-In (summer-winter-summer) was a working modality of the training in all universities.
- With regard to implementation strategies, there was absence of uniformity among the three universities in course arrangement and delivery, implementation of practicum, and assessment of Action research, especially there was inconsistency in action research assessment, even among the various departments of the same university.
- Traditional instructional approach/lecturing by using power points/ was found to be the dominant approach, which implies absence of active and reflective pedagogy which were stipulated in the policy framework.
- There was no formal connection between the subject area course providers (various departments) and pedagogical institutions.
- What was common to the three universities is that the traditional approach of instruction, especially the lecture method was widely used to deliver courses. It implies the teaching learning process was not based on principle of active and reflective pedagogy.
- There was a mismatch between PGDT curriculum framework, the syllabi and the modules, which implies a weak integration among the curriculum components. That is, the translation of the framework to the course syllabi, and the syllabi to the modules was not done appropriately.

- Due to the fact that different university faculties or departments share (in a scattered manner) the task of preparing secondary school teachers, training at that level lacks ownership.
- PGDT also suffers from insufficient facilities/infrastructure like classrooms; laboratories, logistics for practicum, etc. Practicum related challenges include poor coordination and evaluation; shortage of materials and facilities in the schools, and inadequate mentoring of trainee teachers. Hence, teacher education in the country seems far away from aspired goal to produce teachers who are competent in subject areas and pedagogy, and who value the teaching profession as worthy career to practice and lead life in it.

Factors affected the implementation of PGDT Program

Literature (e.g., UNESCO, 2013, Ahmed 2013, Aklilu et al., 2008; Solomon, 2008; Kedir, 2006; MOE, 2003) indicate that teacher preparation programs can be affected by different factors, like unfavorable attitude toward the profession, scarcity of educational resources, shortage of high quality applicant, insufficiency of teachers' subject-matter knowledge and pedagogical skills, insufficient teacher remuneration, contradictions and inconsistencies in policy and practice, poor curriculum organization.

In this light, factors that affected the execution of the PGDT were many, to mention major ones:

- Controversy between the MOE and universities over the mandate of curriculum-making and recruitment and placement of candidate teachers. And the replacement of TESO by PGDT initially faced a lot of resistance from university academics.
- Lack of collaboration among the MOE, the universities, regional education bureaus, and secondary schools in implementing the program-- Practicum related challenges include poor coordination and evaluation; and inadequate mentoring of internees.
- Scarcity of educational materials and facilities, that is, PGDT was suffering from insufficient facilities and infrastructure like classrooms; laboratories, vehicles for practicum, etc.
- Lack of interest and motivation for the program on the part of the candidates as it was manifested in the frequent absenteeism, reluctance in doing assignments, mostly those first degree holders who were unable to get jobs in their area of specialization and decided to become secondary teachers as a temporary solution. It is found out that PGDT students believe that teachers and the teaching profession receive low social respect. It is therefore not surprising that a widespread lack of interest and motivation prevails among trainees of PGDT.
- Prevailed inconsistencies and irregularities among the studied universities in admitting the candidates and in the implementation of the practicum and Action research courses.

Outcomes of the PGDT

Data obtained from interview and questionnaire indicated that there was wide spread dissatisfaction among PGDT graduates (especially of those who joined the profession from other fields) with their working conditions in particular and the teaching profession in general. Causes for their discontent were that many of them were assigned at primary schools (the level which they were not supposed to work at nor prepared and trained for) and PGDT does not feature in the career structure of teachers, that is, teachers who had

completed PGDT and those who hadn't were put in the same basket and got the same salary. For this reason, the teachers were working with poor motivation and they didn't want to continue with the profession, but only until they would get better pasture. So, it was common to see that those teachers who were working in the towns were found looking for other job opportunities (spared much of their time in searching for job vacancies) and doing their studies in non-teaching fields so as to leave the profession, which uncover the situation of teacher turnover.

On top of this, it was reported that teachers who joined PGDT after holding their first degree in non-teaching areas could not assimilate the pedagogical training and develop a sense of professionalism as they were practicing teaching half-heartedly.

Conclusion

The introduction of PGDT was a result of the government's sudden decision to embark on new approach to teacher preparation, but with objection from some old university as it was not backed by plausible research findings. By implication, if educational reform is addressed in isolation or if it adopts only the top-down approach, it likely creates increased antagonism and unwillingness on the parts of implementers to do in the required direction, and the success of the reform would be undermined.

The implementation of program was fettered by different challenges and problems, and suggests a general trend that it was given little attention at all levels, particularly by the implementers, and as a consequence, it was not implemented as intended.

This study is significant as it provides empirical data or information to the teacher education policy makers (MOE) and to the implementers (universities) so that they would make important adjustments and fill in the gaps existing with the subsector.

The responsibility of universities should not end up simply with offering training and awarding of a degree. Rather, they should go beyond that and conduct evaluative research or impact assessment on their training program and obtain systematic feedback from the graduates (alumni) that can be used as the basis for further research and improvement of the program and of the conditions of the graduates. In this light, it becomes worth noting what Darling-Hammond et al (2002) and Schomburg (2003) pointed out, that is, conducting a tracer study to examine the status of graduates and make appropriate adjustments. As they suggested, tracer studies are useful tools to collect information on how well the graduates are doing in the schools; to get feedback from the graduates to modify programs and training system of the education institutions; to meet the needs of schools, etc.

Like any research practice, this study may have some limitations as some bias may incur in it with regard to the selection of research participants, data collection and analysis processes.

Overall, the findings revealed that the implementation of the PGDT program was not as it ought to be at the three universities, but the introduction of PGDT, despite all odds, is believed to have helped address shortage of teachers for secondary schools.

Implications of the Findings

It holds that success of any education policy implementation requires a wide variety of actions and basically depends on adequacy of design and presence of provisions, policy instruments or implementation strategy, commitment and capacity of the system and environmental factors. Therefore, there are several key areas where changes need to be introduced to improve the current secondary teacher education program (PGDT). The results of the study and the conclusions drawn from the findings have the following implication to be considered by the key stakeholders. Other way, the study identified issues that have to be readdressed by the MOE, the universities, colleges of education, departments offering courses, regional education bureaus and secondary schools.

First of all, the MOE, the principal owner of teacher education program, has to base its reform initiatives on plausible research, collaborate with universities as partners with mutual respect in the selection and admission of candidates, in formulating and implementing teacher education programs, and furnish the program with adequate resources and facilities.

Another important implication is that universities and the academics need to value teacher education program as relevant academic program, furnish it with educational materials and facilities required, employ standardized and consistent candidate recruitment and admission procedures; make program implementation a collaborative, team work; revise the curriculum and all existing course modules to improve quality and relevance, and conduct an impact assessment of the program and fill in the gaps.

Colleges of Education, as the host of teacher education program, need to carry out proper follow-up of the training process, make educational resources available on time, hold regular deliberations with course instructors and use feedbacks to make timely corrections; and employ active and reflective methods of course delivery.

The regional education bureaus and secondary schools also need to work closely with the universities so that practicum and action research implementation would be effective and can yield the required results. Most importantly, secondary school leaders and mentors have to work closely with the universities by welcoming and facilitating the practicum and action research projects of the student-teachers while the universities need to make avail all logistics needed for mentors at schools.

At this final point, it is possible to say that the findings and the recommendations put forth are worthy of consideration by the key stakeholders so as to alleviate the long-standing problems fettering the subsector and have a vibrant teacher education system.

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Appendices

Table 1 Profile of the Research Participants			
	Type of Participant	N	Sampling Procedure
1	MOE's Experts	3	Purposive
2	University Teachers	21	Purposive
3	PGDT Trainees	152	Random sampling
4	PGDT Graduates	25	Availability
5	PGDT Coordinators	3	Purposive
6	School directors	30	Availability
7	REB's Experts	3	Purposive
	Total	235	

Table 2 Course Breakdown for the PGDT Program			
Terms	Courses	Total credit hours	Contact hour per week
I	School & Society	3	4
	Psychological Foundations of Learning and Development	3	4
	Secondary School Curriculum & Instruction	4	5
	English for Secondary School Teaching and Learning	3	4
	Teaching in multicultural setting	2	3
II	Subject area method I	4	5
	Teachers as Reflective practitioners	3	4
	Assessment & Evaluation of Learning	3	4
	Inclusive Education	3	4
	Instructional technology	2	3
III	Practicum	4	One month
	Subject area method II	4	5
	Action research project	2	Practicum time

Source: MOE (2009)

Experiential Learning: An Emerging Pedagogical Practice Across School Stages in Light of NEP 2020

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Abstract

Learning is essentially modifying behavior. In schools, different methods derived from various learning theories are employed, each proposing its own pedagogical strategies to improve students' learning. Most agree that learning happens when there is an interactional interplay between the person (intrinsic) with the environment (extrinsic) through purposeful activity. Experiential learning (EL) is one of the most sought-after innovative classroom pedagogies where students develop deeper understandings through activities, experiences and reflection on the concepts. Experiential learning naturally begins at infancy. It allows the learners to retain and apply what they learn at different school levels and even beyond. It is also an important tool for adults to learn. This article emphasizes the recommendation of the National Education Policy 2020 on EL as a teaching-learning practice across the four school stages. It suggests harnessing EL to achieve the goals of NEP 2020, such as fostering critical thinking and problem-solving abilities, engaging through a multidisciplinary approach for holistic development, effective teacher training, blended education, while also incorporating India's rich cultural heritage and multilingualism for a well-rounded and child-centric education system. This article explores EL using Kolb's Learning Cycle as a pedagogical approach and proposes strategies and approaches that teachers must use to tailor instruction for an inclusive and engaging learning environment. Therefore, this article will be insightful for all the stakeholders such as teachers, teacher educators, researchers and policy makers working on increasing overall students' learning outcomes within the context of the Indian school system.

Keywords: Experiential Learning, National Education Policy, Emerging Pedagogy, 21st Century Classroom, Child-Centered Education.

Introduction

'Experiential learning within each subject, and explorations of relations among different subjects, will be encouraged and emphasized despite the introduction of more specialized subjects and subject teachers (NEP, 2020, para 4.5).'

Learning is an ongoing and lifelong process internalized by all individuals. Psychologically, learning is defined as a relatively permanent change in behavior (Kimble, 1961). It involves observing, enquiring, interacting with others, insight, practice, exploring and experimenting things to construct a sense of understanding of our surroundings.

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Our life experiences are an important source for our learning. Children acquire a vast amount of knowledge from everyday life experiences. They observe, listen, play, and actively participate in their environmental settings. Their early experiences, though less complex, significantly contribute to their learning. Experience plays a dominant role in shaping and molding a learner's behavior from birth onwards.

Experience is an interaction of the organism and the environment. Meaningful interaction leaves an impression on the mind (Dewey, 1925). Hence, experiences are “mental and corporeal phenomena” that can be directly or vicariously felt, recounted, reproduced, and transferred to new situations, thereby generating new learning (Janzten, 2013).

A child strikes a matchstick on the side of a matchbox and gets their fingers burned. Such an experience makes the child permanently learn to be careful when handling the matchbox in the future. Similarly, at a young age child understands by observation that if they throw a ball towards the sky, it does fall back to the ground. Here, the child might not have conceptualized the nitty-gritties of ‘gravity,’ yet understands. Hence, through experience, observation and reflection, the information is received by the child.

National Education Policy 2020 gives a central role to experiential learning (EL) as a pedagogical approach across the school stages. It states,

“In all stages, experiential learning will be adopted, including hands-on learning, arts-integrated and sports-integrated education, story-telling-based pedagogy, among others, as standard pedagogy within each subject, and with explorations of relations among different subjects (NEP, 2020, para 4.5).”

Learning precedes all changes in behaviour. New experiences are constructed through the interaction of prior knowledge and experiences, which makes it an ongoing process, thus maintaining the “experiential continuum” (Dewey, 1938). Therefore, experiences and learning are complementary and shape the behaviour of learners. The two-way exchange of experience and learning between the learner and learning tasks forms the basis of EL.

Perspectives of Experiential Learning

EL has found its theoretical and pedagogical stronghold through the works of Kurt Lewin, John Dewey, David Kolb, Jean Piaget and Jean Vygotsky among others. Lewin's Field Theory (1940) emphasizes that behavior formation and goal-directed learning occur when an individual participates in a series of life spaces (work, family, society, etc.). Dewey's Model of Experiential Learning asserts that learners “learn by doing” and “concrete experiences lead to higher-order purposeful action” (Dewey, 1938). Through his Laboratory Schools, he ascertained that life is a laboratory where learners collaborate, work on materials with hands-on activities to gain experience, inquire and test hypotheses. Like Lewin, Dewey also describes, “Learning is a dialectical process that combines experience and concepts, observations, and action.” (Dewey, 1938). Piaget's philosophy of cognitive development supports EL as a pedagogy. Piaget claims that cognitive structures (schemas) are a result of interaction with the environment. Learning takes place through assimilation of experiences into existing schemas/concepts, accommodation of concepts to fit new schemas, and striking a balance (equilibrium) between existing and new information (Piaget, 1936). Therefore, experiences and previous learning constructs new learning. The constructivist philosophy is consolidated by Vygotsky, who

believed learners construct knowledge through close interactions with their socio-cultural environment. This implies the importance of individual and collaborative experiences in the learning process (Vygotsky, 1978).

Experiential Learning Theory (Kolb, 1984)

Kolb pioneered Experiential Learning Theory (ELT). He advocated that learning is creation of knowledge through the transformation of experience (Kolb, 1984). Kolb's theory suggests learners must engage with learning experiences that foster active participation and sensory interactions along with the learning experiences (Akella, 2010).

ELT is based on Kolb's belief that that "ideas are not fixed and immutable elements of thought but are formed and reformed through experience" (Kolb, 2014, p. 36). They are formed and reformed through learners' preferred learning styles, which are influenced by multiple factors such as social environment, educational experiences, and a wide spectrum of learners' cognitive processes (Kolb, 1984). Identifying one's learning styles helps set learning goals, implement learning strategies, reflect on experiences, and take responsibility for one's learning. Kolb's learning cycle provides a structure for identifying learning styles and establishing learning stages. The learning cycle model is a recurring four stages/modes cycle. Through the model, learners engage in a cyclic manner between 4 stages: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE) as shown in Table 1 (Kolb, 1984).

Table 1 Kolb's Stages of Experiential Learning

Concrete Experience (CE)	Learners learn from their surroundings, personal interactions and real-life experiences. They actively participate in the experience through the five senses.
Reflective Observation (RO)	Learners employ cognition to reflect on the experience or situation to form an opinion. They engage in the process through observing and perceiving. They evaluate with objectivity and patience.
Abstract Conceptualization (AC)	Learners create theories and principles based on concrete information and logical reasoning. They use inductive-deductive reasoning to draw conclusions and generalize theories and principles.
Active Experimentation (AE)	Learners use the conclusions drawn in the AC stage as hypotheses to test validity. Learners constantly renew their thinking and methods to conceptualize new experiences and integrate them with past experiences.

Source: Adapted from Kolb (1984), Kolb and Kolb (2013).

Kolb considers any one learning mode to be insufficient in processing information. All four stages/modes of the cycle must be negotiated by the learner for effective learning. However, a learner could enter at any point of the cycle and may learn most effectively through one of the four learning styles based on his/her preferred stage/mode.

Kolb (1984) developed four learning styles based on two continuums, the Processing Continuum and the Perception Continuum (Kolb, 1984).

1. Diverging (CE/RO - Feeling and Observing): Divergers are imaginative and excel at looking at situations from multiple perspectives. They prefer to watch and gather information before acting. They are good at generating ideas and brainstorming about culture and people, and tend to be emotional and open to feedback.
2. Assimilating (AC/RO - Thinking and Watching): Assimilators prefer a logical approach. They are strong at understanding and organizing large amounts of information into clear, logical formats. They are more interested in abstract concepts and theories than in people, and they prefer readings, lectures, and analytical models.
3. Converging (AC/AE - Thinking and Doing): Convergers are practical problem-solvers who can find practical uses for ideas and theories. They are skilled at experimenting with ideas, decision-making and performing technical tasks. They tend to be unemotional and focused on finding a single best solution.
4. Accommodating (CE/AE - Feeling and Doing): Accommodators rely on intuition and prefer a practical and planned experiential hands-on activities. They are adaptable to change, attracted to new challenges. They learn best by doing and actively experimenting with new ideas, often relying on intuition to solve problems.

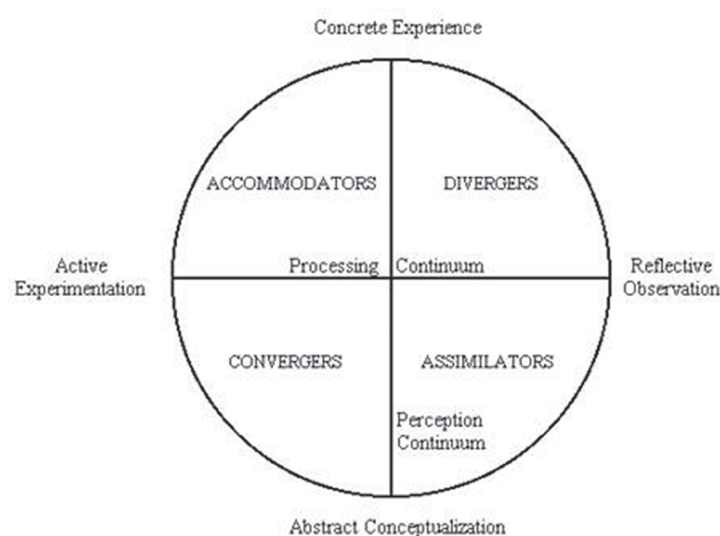


Figure 1. Kolb's Learning Cycle and Learning Styles. *Source:* Olivos et al. (2016)

As children go through stages of development, it would seem that they must fit only one learning stage and slowly progress through the cycle as they grow. However, Kolb refutes this and permits learners at any development stage to enter either of the stages of the cycle and then proceed through other stages of the cycle at their own pace, depending on opportunities presented to them. This continues cyclically.

Literature Review

Multiple pedagogical philosophies have been established and implemented to achieve learning outcomes, focusing on the holistic development of learners through experiential learning. Recent empirical research suggested that EL may be a valuable pedagogical approach to support the acquisition of knowledge and children's academic achievement. EL can bridge the gap between concepts and skills using relevant real-life-based situations. In addition, EL can boost motivation, creativity, and self-confidence while developing metacognitive and practical skills (Gorghiu & Santi, 2016).

EL has been associated with increased engagement, and attendance (Ranken et al., 2024). Furthermore, it is found that EL methodologies positively influence students' employability skills and attributes (Giridharan & Raju, 2016). EL has emerged as a powerful approach for developing 21st-century skills and enhancing critical thinking in education (Pamungkas et al., 2019).

Research indicates that integrating non-cognitive skills into academic curricula and student life can enhance their acquisition (Ahuja et al., 2022). Studies have found that EL programs can make school more enjoyable for students, improve collaboration skills, and foster non-cognitive skills without compromising standardized test performance (Scogin et al., 2017). It can be effectively integrated into various educational contexts, including vocational training and independent learning programs, to foster skills like empathy, collaboration, and real-world problem-solving.

EL has been shown to have a positive impact on academic achievement and promote holistic student development, balancing academic achievement with essential non-cognitive skills across various subjects and age groups. The implementation of experiential learning aligns with NEP 2020's vision of preparing students for the complexities of the 21st-century world.

Experiential Learning Across School Stages

'Pedagogy must evolve to make education more experiential, holistic, integrated, inquiry-driven, discovery-oriented, learner-centred, discussion-based, flexible, and, of course, enjoyable (NEP, 2020, p. 3).'

EL is fundamental, especially for young children who are in their early stages of schooling. They enthusiastically engage through their senses to connect with their environment and activities. As they grow, the use of EL allows them to delve deeper into the dynamics and underlying causes of complicated situations and problems while building critical thinking abilities (Lone & Kaur, 2024).

As per NEP 202's recommendation, a National Curricular and Pedagogical Framework for Early Childhood Care and Education (NCPFECCE) is to be developed by NCERT for children ages 3 to 8 (foundational and primary stages). It recommends research-based international best practices and rich local traditions of India involving art, stories, poetry, games, songs, and more. EL as a teaching approach for holistic development is the sole focus at these stages with the aim of universal foundational literacy and numeracy attainment by 2025 (NEP, 2020, para. 1.3).

A 3-month play-based ‘school preparation module’ for all Grade 1 students as directed by NEP 2020 has been developed by NCERT. It constitutes EL activities and workbooks for the learning of alphabets, sounds, words, colours, shapes, and numbers (NEP, 2020, para. 1.3).”

Moreover, the National Curriculum Framework for School Education (NCF SE) 2023 states that by middle school, learners gradually gain logical thinking, experience complex emotions and display objective expression to make fair moral judgements. Here too, EL paired with relevant academic activities improves learners’ motivation and sense of autonomy equips learners to be problem solvers (Kolb & Kolb, 2011).

For grades 6 to 8, the NEP 2020 mentions that students must acquire mathematical and computational skills through a variety of innovative and experiential methods, including coding, puzzles and games that make mathematical thinking more enjoyable and engaging. (NEP, 2020, para. 4.25).

Four years of secondary education have been laid out for multidisciplinary study with a greater focus on critical thinking and aspirations for life, offering greater flexibility in subject and discipline choices for the students. The curriculum style at this stage must extend from the middle stage and hence, must also be experiential. Students also have an option to drop out after 10th class and re-enter in the next phase for specialized vocational or similar experiential courses in classes 11th and 12th (NEP, 2020, para. 4.2).

Throughout the schooling years, EL practices such as activity-based learning, integration of sports, vocations and arts must be incorporated (NEP, 2020, para. 4.6). For gifted and talented students, the NEP 2020 highlights the need for EL-based pedagogy by giving them supplementary enrichment materials and guidance. Project-based clubs and circles such as science circles, math circles, music & dance circles, health & well-being clubs must integrate schools, school complexes, districts, and beyond (NEP, 2020, para. 4.44).”

Piaget explains that children, as they transition through school, enter into the formal operational stage. They begin to develop logical thinking with increased interest in abstract concepts such as freedom, love and justice (Piaget, 1936). Adolescents begin to construct relationships between concrete operations and abstract forms. Children at this stage of abstract conceptualization can perform hypothetical-deductive reasoning, which involves developing hypotheses based on what might logically occur (Kolb, 1984, p.36). They begin to apply cognitive, communicative and creative problem-solving skills through socio-emotional interactions. Thus, it is important of teachers to know, identify and cater to all learners as per Kolb’s learning stages and learning styles, for developing critical thought, creativity and relevant skills must be acknowledged.

NEP 2020 reconciles Piaget’s stages of development (sensorimotor, preoperational, concrete operational, and formal operational (Piaget, 1936)) and Kolb’s learning cycle with classroom pedagogical approaches. In accordance, teachers must use multiple methods from different EL stages, allowing maximum engagement from learners of varied learning styles to cater to a diverse classroom. Based on the learning content, a teacher may demonstrate a concrete model for learners’ active hands-on engagement. The teacher may also ask questions and discuss topics to encourage learners to reflect on concepts, provide reading materials for abstract conceptualisation, and give models/projects for learners to design to apply the knowledge learnt. In this way, a teacher may allow students to holistically progress through all 4 stages of the learning model.

It may also come across that NEP 2020 endorses Piaget’s theory, outlining a sequential progression of cognitive development in children as they progress through the 4 school stages. Kolb’s model, on the other hand, seems more applicable to adult learning as it emphasizes a nonlinear, continuous cycle of experience

and reflection, allowing learners to enter at any stage and revisit stages as needed (Kolb, 1984). Both Piaget and Kolb are in agreement that varied modes of experiences must be presented to the learner to catalyse learning, along with active engagement with content and reflection.

In conclusion, throughout school, learning should rely more on EL with hands-on exploration as the main source of learning and discovery. It helps students engage in authentic, real-world experiences that cultivate their knowledge, skills, and character. It promotes a deeper understanding of the subject matter and encourages the development of well-rounded individuals (Lone & Kaur, 2024).

Significance of Experiential Learning in Achieving the Goals of NEP 2020

The NEP 2020 policy reflects on the significance of EL and aligns it with its goals:

- Focused on critical thinking and problem-solving: NEP 2020 has made it clear that the syllabus content will be reduced, centered around critical thinking. EL is designed to promote the necessary skills by presenting students with real challenges, encouraging them to analyze situations, and developing innovative solutions (Lone & Kaur, 2024).
- Multidisciplinary approach: NEP 2020 allows children to explore diverse subjects and areas of interest. EL naturally supports this approach by providing opportunities for students to integrate knowledge from various disciplines in real-world contexts (NEP, 2020, para. 11.2). Teachers trained in carrying out teaching through a multidisciplinary perspective using EL and similar child-centric approaches must be hired.
- Vocational training: EL can be effectively integrated into various educational contexts, including vocational training and campus learning programs, to foster skills like empathy, collaboration, and real-world problem-solving (Dona et al., 2024).
- Development of non-cognitive skills: Findings from studies suggest EL can be effectively implemented across various educational settings to promote holistic student development, balancing academic achievement with essential non-cognitive skills. A case study at the secondary level has demonstrated a significant positive impact of EL on knowledge acquisition, social skill development, and cultural awareness (Voukelatou, 2019).
- Teacher training and professional development: NEP 2020 highlights the importance of teachers' professional development and especially EL so that teaching becomes effective (NEP, 2020, para. 15.4).
- Blended education: The NEP 2020 encourages blending EL with online/digital education to make it efficient and effective. It believes that digital education at the school level has limited scope, especially in subjects with practical applicability (NEP, 2020, para. 24.3).
- Holistic assessment: For reporting student performance, holistic progress cards must be used designed as per the guidance of NCERT and SCERTs. It must be able to convey the performance of a child on all 3 domains through project-based and inquiry-based learning, quizzes, role play, portfolios and other EL learning approaches. It should also have scope to record feedback based on the child's self-assessment, with peer assessment and teacher assessment (NEP, 2020, para. 4.35).

- Building upon India's rich culture: NEP 2020 focuses on India's traditional, cultural and ethical values. EL helps students think and learn using art forms, festivities and folk tales, and adopt traditional knowledge of astronomy, astrology, administration and planning, architecture, craft and medicine with modern science, thereby making learning wholesome.
- Multilingual education: Multilingualism and especially the learning of Sanskrit must be offered at school and higher levels as well. India's rich literature in classical languages is a treasure trove of knowledge. Tamil, Telugu, Kannada, Malayalam, etc. may also be opted by learners even through digital/online modules, through experiential and innovative approaches. (NEP, 2020, p. 4).

Holistic development includes the cognitive, affective and psychomotor development of the child. Holistic development of students, going beyond academic achievements to include life skills to prepare learners for the challenges of life (Lone & Kaur, 2024). NEP 2020 emphasizes EL to foster holistic, multidisciplinary and child-centered education by applying theoretical knowledge in real-world scenarios, thereby developing well-rounded individuals (NEP, 2020, para. 11.3).

Role of Teachers in Inculcating Experiential Learning

The following nine points should be acknowledged by a researcher when planning and executing the EL process (Chapman, McPhee, & Proudman, 1992, p. 243)

- Content and process: Teaching and learning should be in harmony between the experiential activities, the relevant content and the conceptual knowledge. Knowing Kolb's learning style helps teachers to understand the importance of questioning strategies, explicit instruction and lecture methods in the EL process.
- Monitoring and encouragement: The primary task of the teacher in EL classroom is to create a safe space for students and allow room for self-discovery. They shouldn't judge learners on their thinking, effort, pace, success and failure.
- Purposeful learning: In the EL process, learners choose their learning and self-teach themselves. Therefore, learning must be meaningful for the learner. Teachers should be aware of learning modes and styles to plan learning activities that are personally relevant to the learner.
- Encouraging to think beyond: Experiential activities should draw connections between the learning that learners are doing within the class and the world outside. Teachers should design activities that build learners' ability to see relationships in complex systems and find a way to work within them.
- Building emotional resilience: Students must be fully immersed in the experiential learning experience. However, this should not make them feel limited in what they are expected to achieve from the learning objectives. Teachers should be able to engage the learners in the experiential process to an extent that encourages them, builds their confidence and resilience to set their own goals and pursue them.
- Reflection and self-discovery: Learners should be able to realize the opportunities that open from their learning, which happens through experiences and interactions with the world. Teachers should therefore provide space that is safe for self-exploration, where learners analyze themselves by being resilient and introspecting their own value system.

- **Meaningful relationships:** Teachers must encourage the learners to navigate the real world through what they are learning. For this, instructional strategies should help learners to analyze themselves, their strengths, and connect with the teacher, peers, as well as the learning environment resulting in enhanced learning outcomes.
- **Collaboration and communication:** Teachers should foster collaborative and team spirit through EL opportunities such as hands-on activities, role-plays and simulations, flip classroom, field trips, excursions, projects, etc. Shared experiences from a variety of resources, environment and society develop lifelong skills.
- **Stepping out of comfort zones:** Learners are motivated to challenge beyond their comfort zones. Learners should be allowed to explore beyond their immediate environment, but also in their perceived societal settings such as being accountable for their actions and taking responsibility for the consequences.

A teacher must also incorporate assessment and feedback that align with EL. Learning needs to be observable, measured, quantified, and defined in terms of the learning outcomes. Teachers should provide timely feedback by integrating all components of instructional practices, on which learners reassess their attempts and modify their behaviour for new experiences. The role of experiential learning is where dialogue, students' active involvement and action are encouraged (Sachdeva, 2017).

Conclusion

NEP 2020 emphasizes that the focus of school must shift completely towards experiential learning through hands-on activities, integration of arts, sports, storytelling and other pedagogies in each subject discipline. The classroom teaching and learning should be re-designed, bottom-up, so that they focus more on competency-based education (NEP, 2020, para 4.6).

The ancient Indian knowledge system gave importance on the holistic development of the learners. Unfortunately, this intent had not translated over time in the Indian school system, which got reduced to rote memorization and bare reproduction of facts. However, at present, the learners' educational needs are shifting towards more purposeful learning, where they can actively participate and develop skills that can be applied in real-world situations.

NEP 2020 aims to cultivate well-rounded individuals capable of rational thought, empathy, and creative imagination with strong ethical and cultural foundations. Experiential learning is central to achieving this vision, as it promotes critical thinking and problem-solving through real-world challenges. It aligns with the NEP 2020's emphasis on reduced syllabus content and focuses on essential skills. Furthermore, EL naturally supports a multidisciplinary approach, allowing students to integrate knowledge across diverse subjects and foster holistic development beyond academic achievements. It also plays a vital role in vocational training, developing crucial non-cognitive skills through practical, child-centric approaches. EL will also be instrumental in integrating India's rich cultural heritage and multilingualism to create a comprehensive and vibrant educational experience.

Studies in the field of pedagogy highlight the importance of EL to create an educational environment where students are motivated to engage and participate in their learning through experience. The generative and

transformative potential of integrating experiences in the learning process needs to be considered as a strong pedagogical practice.

This article also presented the need, practicality, and significance of Kolb's Experiential Learning Model through the school stages as emphasized by NEP 2020. EL makes education more engaging and holistic. For young children, EL leverages their natural curiosity and sensory engagement to foster foundational literacy and numeracy. As students progress to middle and secondary stages, EL evolves to develop critical thinking, problem-solving, and abstract reasoning through activities like puzzles, coding, and project-based learning. NEP 2020 encourages continuous integration of EL, including sports, vocations, and arts, and provides provisions for gifted students as well by allowing specialized engagement through clubs, circles and inter-school collaboration. This approach aligns with both Piaget's stages of cognitive development and Kolb's learning cycle, advocating for diverse teaching methods that engage learners through concrete experience, reflective observation, abstract conceptualization, and active experimentation, ultimately promoting deeper understanding and well-rounded individuals (Kolb, 1984).

NCF SE 2023 resonates with NEP's goal on effective pedagogy and holistic development of learners.

'Depending on the matter of study, context, and stage of the student, these effective pedagogical approaches would be of a wide range, including pedagogy that is more experiential, integrated, inquiry-driven, discovery-oriented, discussion-based, project-based, arts-based, sports-based and activity-based. Such pedagogy will not only be more effective but also more engaging and enjoyable (NCF SE, 2023, p. 19).'

NEP 2020 aims to make the education system in India second to none by 2040, by developing social, emotional and ethical capabilities of learners along with cognitive competence through all stages of education (NEP, 2020, p. 4). Integration of experiential learning and its multidisciplinary facilities makes it a sought-after avenue for classroom pedagogy to achieve this objective.

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Lesson Planning Software Applications' Competency Training Needs of Business Education Lecturers for Instructional Delivery in North-east Nigerian Universities

Suleiman HAYATU

Abstract

The main aim of the study was determining the training needs of business education lecturers on the usage of lesson planning software applications for instructional delivery. The study was carried out in the North-eastern region of Nigeria. The study adopted mixed method design. The population of the study comprises 57 business education lecturers in the region. The entire population was used for the quantitative part of the study, while 3 lecturers were sampled for the qualitative part using purposeful sampling technique. The instruments for data collection were structured questionnaire and interview for quantitative and qualitative parts of the study respectively. The questionnaire was validated by five experts while the interview schedule was validated using members' checking. The reliability (internal consistency) of the questionnaire was determined using Cronbach's alpha, a coefficient of 0.78 and 0.82 for importance and ability dimensions respectively were found. Peer debriefing method was employed in determining the reliability of qualitative data collection instruments. The researcher together with two research assistants administered the instruments to the respondents manually. In quantitative data collection, a total of 48 questionnaires were retrieved. The quantitative research question was analyzed using mean weighted discrepancy score (MWDS) while the hypothesis was analyzed using one-way analysis of variance statistics. The qualitative research question was analyzed using thematic analysis. The finding of the study among others revealed that business education lecturers need training in the usage of lesson planning software applications for instructional delivery. It was also found that a significant difference does not exist among business education lecturers who specialized in accounting, marketing and office technology management on their training needs in the use of lesson planning software applications. The study recommended that business education lecturers should be trained on the effective usage of the software applications for efficient instructional delivery.

Keywords: Training Needs, Lesson Planning, Software Applications, Instructional Delivery.

Introduction

The relevance of Information and Communication Technology (ICT) in instructional delivery cannot be overemphasized most especially in emerging nations such as Nigeria. In the last decade, ICT has influenced innovations in lecturers' instructional delivery practice (Janssen *et al.*, 2019) most especially through the use of software applications. Among the ICT resources, lesson planning software applications can assist lecturers in planning and preparing their instructional delivery in time. In view of this, there is need for university lecturers particularly business education lecturers to effectively utilize these software applications in their lesson planning process

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Business Education refers to education for and about business combining both theoretical and practical knowledge, to expose the recipients to the economic system of their society and equip them with necessary lifelong skills that will enable them to make intelligent judgment as employees, producers or consumers (Agbo, 2018). In other words, business education is the inculcation of relevant competencies needed by individuals to enable them not only teach business concepts, beliefs, ideas, knowledge and skills but also be able to perform effectively and efficiently as accountants, marketers and office managers in the business world (Hayatu, 2025). There are three broad areas of specialization in business education which include accounting, marketing and office technology management education as shown in Figure 1.

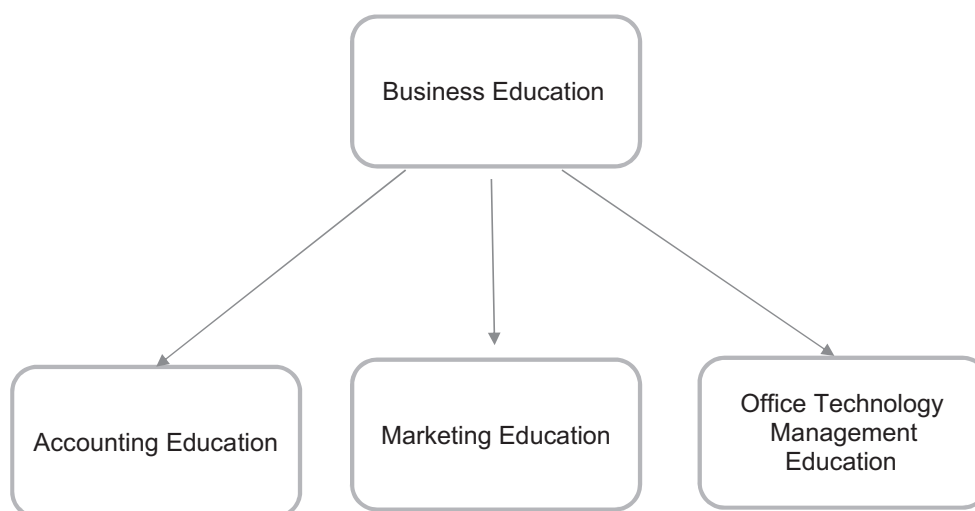


Figure 1: Broad Areas of Specialization in Business Education

It is a well-known fact that most of the business education lecturers in tertiary institutions of learning lack the competencies necessary in meeting up with the emerging technology for instructional delivery (Okanazu *et al.*, 2017). Hence the need for ascertaining the required competencies of utilizing software applications for instructional delivery and research among business education lecturers becomes imperative as concurred by Agbo (2018) who stated that business education lecturers are highly instrumental to the integration of ICT driven education in Nigeria. One of the avenues where business education lecturers can utilize software applications is in the preparation of lesson plans.

Preparation of lesson plan is among the relevant practices toward improvement of the quality of instructions since effective planning of the lesson assists lecturers to improve instructional delivery. Lesson planning is a core activity of professional teachers (Konig *et al.*, 2020) and also a precondition for effective instructional delivery (Strickroth, 2019). In support of this, Stella as cited by Halala and Seni (2022) argued that the quality of instruction is determined by instructors' preparation and effective use of lesson plans. Similarly, Innocent (2021) asserts that among the benefits of effective lesson planning include improving instructions and consequently improving the students' academic performance. Lesson planning did not only serve as a guide to the teachers in instructional delivery, but also assists them on how learners' abilities are to be distributed in the classroom (Basturk *et al.*, 2022). Today, lesson plans were developed using software applications which simplify the complex process of planning the lesson thereby facilitating instructional delivery (Strickroth, 2019). Lesson planning software applications are packages used for the design and preparation of lesson

plans. Example of these applications include: Planner, Lesson Plan Maker, PlanbookEdu, MyLessonPlanner, Planboard, Lesson Planner Advanced, StarPlanIt, Coach Diary, Common Curriculum, Plan4Me, Lesson Planning System (LPS), Fun 5 Plans, Instructional Planning Assistant System (IPAS), Support for Teachers Enhancing Performance in Schools (STEPS), Eduwiki (EW), Inquiry in Motion Dynamic Lesson Planning Tool (IIM), Smart Lesson Planning System (SLP), The Learning Designer (LDSE), TaskStream (TS), Phoebe Pedagogic Planner (Ph) and many more (Monett & Weishaar, 2015; Common Sense Media, 2020; Strickroth, 2019).

Utilization of computer software applications in instructional delivery has contributed significantly in simplifying and executing teaching and learning processes (Ajunwo, 2017). One of the avenues that university lecturers can utilize software application in the teaching and learning process is in lesson planning. In achieving this, there is need for training the lecturers on how best to utilize lesson planning software applications in planning their lessons, even though Ahmad *et al.* (2019) reported that university lecturers in general are having difficulties in preparing their lectures using ICTs in classroom, this can be attributed to the inadequate training among them. In order to have a successful training of the lecturers, there is need to ascertain their present competency level with regards to the usage of lesson planning software applications which this study investigated.

Literature Review

There are various studies conducted that are relevant to this study; Onajite and Aina (2017) reported that business education lecturers in colleges of education need training in the preparation of lesson plans using computer system; Ahmad *et al.* (2019) reported that university lecturers are having difficulties in preparing their lectures using ICTs in classroom. Ardic and Ciftci (2019) reported that teachers need training in the use of ICTs. Moreover, Anaza (2019) concluded that student-teachers in colleges of education need training in the use of software applications. In the same vein, Hassan and Mirza (2021) argued that 94 percent of teachers need training to support the utilization of ICTs in instructional delivery. Also, the findings of Dlamini and Mbatha (2018) indicated among others that teachers need professional development (training) in the use of ICT in teaching. Similarly, the findings of Dzikite *et al.* (2017) revealed that lecturers of textile and clothing in one university of technology in Zimbabwe need training in the use of software applications for instructions. Based the previous studies, the evidence of training needs in the use of lesson planning among business education lecturers in universities at least in North-east Nigeria is yet to be known to the best of the researchers' knowledge as at the time of reporting this study.

Research Questions

The following questions were raised to guide the study:

- i. What are the competency training needs of business education lecturers in the usage of lesson planning software applications for instructional delivery?
- ii. What are the views of business education lecturers on their competency training needs in the usage of lesson planning software applications for instructional delivery?

Research Hypothesis

Ho 1: Significant difference does not exist on the competency training needs in the usage of lesson planning software applications among accounting, marketing and office technology management lecturers.

Methodology

North-eastern region of Nigeria was the area of the study. Explanatory sequential mixed method design was the design of the study. The population of the study consists of 57 business education lecturers in the study area. The total population of the study was used for the quantitative part of the study, while 3 lecturers were sampled using homogeneous purposeful sampling technique for the qualitative part. The instruments for data collection were closed-ended questionnaire and interview for quantitative and qualitative parts of the study respectively. The questionnaire was developed by the researcher with a dual-response format based on McKim (2013) redesigned Borich Needs Assessment model. The questionnaire was validated by four experts from the fields of business education, ICT and measurement and evaluation, the experts were drawn from Abubakar Tafawa Balewa University Bauchi and Modibbo Adama University Yola, while the interview schedule was validated using members' checking. The internal consistency (reliability) of the questionnaire was determined using Cronbach's alpha, coefficients of 0.78 and 0.82 were obtained for importance and ability dimensions respectively.

With the aid of two research assistants, the researcher administered the instruments to the respondents manually because of the manageable size of the sample. In a quantitative data collection exercise, a total of 48 questionnaires were retrieved. The qualitative data collection was conducted using a smart phone which is automatically recording the interview, the recordings were later transcribed into three transcripts for effective data analysis. The quantitative research question was analyzed using mean weighted discrepancy score (MWDS) with the aid of MWDS Calculator developed by McKim and Saucier (2011), while the hypothesis was analyzed using one-way analysis of variance statistics with the aid of SPSS software version 25. The qualitative research question was analyzed using thematic analysis.

A positive MWDS was interpreted and considered "training needed" (TN) while a zero or negative MWDS was interpreted and considered "training not needed" (TNN). This is in line with the assertion of Borich (1980) who asserts that higher MWDSs are indication of the competencies that should be targeted through conducting training programme or intervention.

Findings of the Study

The study's findings were presented based on the following quantitative and qualitative aspects of the study:

Findings of the Quantitative Study

The findings of the quantitative study were the results of research question one and the null hypothesis as presented as follows:

Research Question One: What are the competency training needs of business education lecturers in the usage of lesson planning software applications for instructional delivery?

Table 1 MWDS of the Competency Training Needs of Business Education Lecturers in the usage of Lesson Planning Software Applications for Instructional Delivery			
S/N	Competencies	MWDS	Decision
1	Logging /Signing in	-2.38	TNN
2	Setting date/Creating or switching of school year	4.88	TN
3	Adding class set up and schedule	5.05	TN
4	Editing class set up and schedule	4.70	TN
5	Importing events	4.59	TN
6	Creating lessons	-0.85	TNN
7	Editing lessons	4.51	TN
8	Adding home work	6.11	TN
9	Adding notes and events	5.59	TN
10	Adjusting lesson	5.61	TN
11	Adjusting events and 'no school days'	4.90	TN
12	Sharing lessons with other teachers	6.24	TN
13	Applying standards and standards reporting	6.41	TN
14	Navigating lesson plans	5.64	TN
15	Printing lesson plans	5.87	TN
	Cumulative MWDS	4.46	TN

Source: Field Survey (2023). KEY: MWDS = Mean Weighted Discrepancy Score, TN = Training Needed, TNN = Training Not Needed

As presented in Table 1, thirteen (13) out of the fifteen (15) competency items for lesson planning software application (LP) show a positive MWDSs indicating that training is needed (TN) on those competency items while only two (2) of the competency items show either zero or negative MWDSs indicating that training is not needed (TNN) on those competency items which are LP 1 and LP 6.

The cumulative MWDS was 4.46 indicating that training is needed among business education lecturers in the usage of lesson planning software application.

Research Hypothesis One: Significant difference does not exist on the competency training needs in the usage of lesson planning software applications among accounting, marketing and office technology management lecturers.

Table 2	One-way ANOVA on the Competency Training Needs of Business Education Lecturers in the usage of Lesson Planning Software Applications					
	Sum of Squares	Df	Mean Square	F	P-value	Decision
Between Groups	0.111	2	0.056	0.036	.964	Accept
Within Groups	69.154	45	1.537			
Total	69.266	47				

Source: Field Survey (2023)

As indicated in Table 2, the result of the one-way ANOVA shows that the p-value (0.96) is greater than the alpha value (0.05), therefore, the null hypothesis one is hereby accepted, this means that significant difference does not exist on the competency training needs in the usage of lesson planning software applications among accounting, marketing and office technology management lecturers.

Findings of the Qualitative Study

In answering research question two, Participants 1, 2 and 3 were asked about their views on their training need in the usage of lesson planning software applications through the following questions:

- i. Do you think you need training on the usage of lesson planning software applications?
- ii. Could you briefly describe your view on why you think you need training in the usage of lesson planning software applications for instructional delivery?

In response to the interview questions, Table 3 reveals the participants' views, codes, sub-themes and the main theme.

Table 3	Coding Matrix on the Views of Business Education Lecturers on their Competency Training Needs in the usage of Lesson Planning Software Applications		
Themes	Sub-Themes	Codes	Interview Transcripts
Lesson Planning Software Application	Training Need, Importance, Accuracy	I need training, Importance and accuracy in planning of lessons	Participant 1: Yes indeed. I need training on the use of lesson planning software applications because of their importance and accuracy in the planning of lessons which is one of the prerequisite for effective and efficient instructional delivery.

	Training Need, Importance, Accuracy	Need for training I think the software will be useful and important to me, will make my lesson planning more accurate	Participant 2: Yes I need. My personal view on my need for training is that I think the software will be useful and important to me. Also, I believe that lesson planning software application will make my lesson planning more accurate.
	Training Need, Inadequate Training, Importance	I need training, I was not trained, it is highly important	Participant 3: Yes. My opinion is that I need training because I was not trained on how to use the software for instructional delivery practice even though it is highly important.

Source: Field Survey (2023).

Based on the views expressed by the participants in Table 3, all the participants need training on the use of lesson planning software applications for instructional delivery. The participants also indicated the reasons behind their need of training which includes; importance of the software applications, its accuracy in lesson planning, non-availability of the software applications among them and inadequate training on effective usage of the software applications for instructional delivery.

Discussion of Findings

The finding of research question one indicated that training is needed among business education lecturers in the usage of lesson planning software application in North-east Nigerian universities, the finding is in agreement with that of Onajite and Aina (2017) who found that business education lecturers in colleges of education need training in the preparation of lesson plans using computer system, the finding also concurs with that of Ahmad *et al.* (2019) who reported that university lecturers are having difficulties in preparing their lectures using ICTs in classroom, the finding also supports that of Ardic and Ciftci (2019) who reported that teachers need training in the use of ICTs. The finding is in conformity with that of Anaza (2019) who concluded that student-teachers in colleges of education need training in the use of software applications. The finding is in tandem with that of Dlamini and Mbatha (2018) who revealed that teachers need professional development (training) in the use of ICT in teaching. In the same vein, the finding is supporting the findings of Dzikite *et al.* (2017) who concluded that lecturers of textile and clothing in one university of technology in Zimbabwe need training in the use of software applications for instructions.

On the other hand, the finding of the research hypothesis shows that a significant difference does not exist on the competency training needs in the usage of lesson planning software applications among accounting, marketing and office technology management lecturers. The finding supports the finding of Saleh (2018) who reported that there is no significant relationship between the training needs of agricultural extension officers in Central Iraq and their specialization. Similarly, the finding also agrees with that of Haleem (2018)

who reported that a significant difference does not exist between extension agents' training needs and their specialization. On the contrary, the finding disagrees with the finding of Alotaibi *et al.* (2019) who found that there is a significant relationship between extension agents' training needs and their area of specialization. This difference can be attributed to the differences in population, area of the study and the area of training needs.

Similarly, the finding of research question one (quantitative aspect of the study) was supported by the finding of the research question two (qualitative aspect of the study) which revealed that all the participants need training on the use of lesson planning software application, also revealed that importance of the software, its accuracy in lesson planning, non-availability of the software applications among them and inadequate training on effective usage of the software for instructional delivery were the reasons why business education lecturers need training in the usage of lesson planning software applications for instructional delivery in North-east Nigerian universities. The finding supported that of Bransletter *et al.* (2019) who asserted that software application is highly important. The finding is also in line with that of Walton (2019) who argues that software applications increase accuracy thereby eliminating or minimizing human errors. The finding also corroborates with that of Ezeabii and Okonkwo (2019) who found that inadequate training on the use of modern multimedia tools and their non-availability are among the lecturers' constraints in teaching business education courses in public universities in South-east Nigeria.

Recommendations

- i. There is an urgent need for training and capacity building of business education lecturers on the effective use of lesson planning software applications for efficient instructional delivery.
- i. Business education lecturers should ensure the effective utilization of lesson planning software applications as they are perceived to be important and accurate in preparation and planning of classroom instructions.

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Financing Universal Basic Education in Junior Secondary Level and Its Impact on Nigeria's Economic Development

Augustine Ele Asor, Chinonyerem E. Asor and Edward Bassey Ele

Abstract

Education undoubtedly is a priority sector in every well-meaning society since it is the most fundamental tool for development and growth. In Nigeria, the Universal Basic Education (UBE) was introduced in 1999 to ensure that children of school age have access to basic education. This study investigates how the UBE programme has fared in enhancing schooling in the junior secondary schools (JSS). With a sample size of 130, the questionnaire was the instrument used to generate data which was analysed by the use of the mean and rank statistics. The paper reveals that a lot still has to be done in terms of infrastructure noting that schooling in the Junior Secondary level is not still universal after all. It recommends among other things that the government should increase the funding of the programme.

Keywords: Education, Development, Infrastructure, Funding, UBE.

Introduction

There is no doubt that education is a priority sector in every well-meaning society as it is the most important tool for development in all modern economies. Ochoyi and Danladi (2010) asserted that education is generally concerned with transmission of worthwhile values such as skills, knowledge and planned activities that can develop learners' potentials for national development. Fabunmi (2014) stated that basic education can be viewed as fundamental education or formation education or bottom line education upon which every other education whether formal, informal or non-formal can be built and without which any educational structure erected will have chances of success. In Nigeria, Universal Basic Education (UBE) is a fundamental component of her educational policy, designed to provide free and compulsory education for all children at the primary and junior secondary school levels. The program, established through the UBE Act of 2004, aims to eliminate illiteracy, enhance skill acquisition, and foster national development by ensuring equitable access to quality education (Federal Republic of Nigeria, 2004). Despite its noble objectives, the financing of UBE, particularly at the junior secondary school level, remains a significant challenge due to inadequate funding, mismanagement of resources, and disparities in allocation across states (Okeke & Eze, 2020). The effectiveness of UBE financing directly influences enrollment rates, retention, and the quality of education, which in turn has far-reaching implications for Nigeria's economic development.

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Investing in universal basic education therefore is critical for sustainable economic growth, as it equips the youth with essential skills needed for productivity and innovation. According to the World Bank (2018), every additional year of schooling can increase an individual's earnings by up to 10%, thereby contributing to poverty reduction and economic diversification. In Nigeria, where a significant proportion of the population is under 18 years old, ensuring adequate financing for junior secondary education can help harness the demographic dividend by creating a skilled labor force capable of driving industrialization and technological advancement (Adeyemi & Akpotu, 2019).

The essence of education according to the Nigerian National policy on Education (2004) is for the following:

- a. To develop an individual into a morally sound, patriotic and effective citizen.
- b. To integrate the individual in the immediate community, the Nigerian Society and the world at large
- c. To inculcate in the individual national consciousness, unity and values
- d. To develop for the individual appropriate skills, mental, physical and social abilities/competencies and empowerment to live in and contribute positively to society.

In view of the above, there is a need to make basic education compulsory if the nation hopes to reduce illiteracy, underdevelopment, ignorance and poverty while energizing and speeding the pace of national development, political awareness and national cohesion. However, insufficient funding, poor infrastructure, and teacher shortages continue to hinder the program's success, limiting its potential impact on national development (Obioma & Salau, 2021).

This paper examines the financing mechanisms of Universal Basic Education at the junior secondary school level and evaluates its impact on Nigeria's economic development.

The work would be guided by the following research questions

- a. Has financing UBE in Junior Secondary improved infrastructure?
- b. Are the teachers in the UBE schools well trained and qualified?
- c. Has financing the UBE programme tackled the issue of dropouts in Junior Secondary Schools?

The Universal Basic Education (UBE) Act 2004

The Universal Basic Education bill was an executive sponsored Bill sent to the National Assembly to give a legal backing to the Universal Basic Education (FRN 2004). The 1st and 2nd reading of the Bill were on 26th and 27th August, 2003 respectively and the 3rd reading was on 28th August, 2003, the Bill was passed into law by both houses of the National Assembly on 28th August, 2003. The president Olusegun Obasanjo, signed the Bill into law on 12th May, 2004 the Bill according to the Federal Republic of Nigeria, (2003) seeks:

To provide a compulsory, free Universal Basic Education (UBE) for all Children of primary and Junior Secondary School age, it further seeks to provide punishment for parents for failing to comply with its provisions”.

The new legal status of the scheme according to Iheonunekwu, and Nkemakolam, (2006) has the following far reaching implications.

- Its policy objectives aim to provide universal free and compulsory education at the primary and the first three years of secondary school and to provide functional literacy for adult illiterates.
- Universal Basic Education (UBE) has now become everybody's obligation including governments, civil society, and organized private sector, the formal and informal sector, Parents Teachers Association, students and parliamentarians.
- The problem of poverty being an impediment to schooling has been eliminated.
- There are sanctions for parents who failed to send their children and wards to school.
- UBE is inclusive education since it embraces both the formal and the non-formal settings.

UBE in Nigeria

Preece (2006) submitted that education is a proven contributor in the reduction of poverty level and with the introduction of the Universal Basic Education (UBE) in Nigeria by the Olusegun Obasanjo administration in May 1999, the belief is that development of the country will be accelerated because of the intrinsic value in education.

The UBE scheme was brought up to improve on the shortcomings of the universal primary education (UPE) of the 1970s which ironically was also introduced by the same Olusegun Obasanjo as military head of state. The Federal Ministry of Education (1999) came up with specific objectives for the scheme; these are

- a. Developing in the entire citizenry a strong consciousness for education and a strong commitment to its vigorous promotion.
- b. Ensuring the acquisition of the appropriate level of literacy, numeracy, manipulative, communicative and life skills as well as ethical, moral and civic values needed for laying solid foundation for lifelong learning.
- c. Catering for the learning needs of young persons who for one reason or another have had to interrupt their schooling through appropriate forms of complementary approaches to the provision and promotion of basic education.
- d. Reducing drastically the incidence of drop outs from the formal school system (through relevance, quality and efficiency) and
- e. Providing free universal basic education for every Nigerian child of school age.

According to Fabunmi (2014), the program was developed as a response to the level of consciousness and general education of the populace. The large population of the disadvantaged groups, the rural community, the girl child, the nomadic, the disabled, the almajiri and the crisis of boys dropping out were all taken into consideration when the UBE scheme was introduced. Also taken into consideration were the issues of facilities and infrastructure to make the school environment learner friendly thereby recognizing the freedom of teachers and school administrators.

The UBE is conceived to be tuition free from the primary to the secondary level which Ukeje (1991) likened to the first nation-wide tuition free primary education scheme launched in September 8th 1979. The rationale being that it is a prerequisite for the equalization of educational opportunities across the country.

To emphasize the need of the UBE, Obanya (2000) threw light on the international and national antecedents of the scheme drawing attention to the following:

- a. The 1948 universal declaration on human rights which stressed the right of every one to education with special reference to basic education
- b. The establishment of the United Nations Educational Scientific and Cultural Organization (UNESCO) was a fallout from an international conference on the educational crisis in Paris in 1968.
- c. The Jomtien (1990) world conference on education seeking a universal precise definition of basic education.
- d. The Ouagadougou (1992) declaration on the education of girls and women.
- e. Recife (Brazil) declaration on the pursuit of the New Delhi (1991) goals on massive reduction of illiteracy.
- f. Social development summit Copenhagen (1996)
- g. The Beijing conference on women and development (1997)
- h. The Dakar (2000) recommendation on the pursuit of Jomtien goals.
- i. OAU decade of education (1997-2006).

However, from all the international context the most important lesson from the Jomtien goals of 1990 which came up with a declaration and framework of action on education for all (EFA) presenting basic education in the following words:

- a. Basic education is that groundwork level that underscores literacy, innumeracy, basic life skills and most fundamentally learning-to-learn skills.
- b. Basic education is a process and not a package
- c. Basic education is a question of skills acquisition and not a question of years of formal education.
- d. Basic education de-emphasizes drop outs and repetition while placing much importance on learning.

UBE and the Junior Secondary Schools (JSS)

Basic education worldwide is the platform for sustainable development and lifelong learning which is intended to provide essential skills in reading, writing and arithmetic. In Nigeria, the basic education covers primary, junior secondary and non-formal education (Adu 2018).

The junior secondary education involves three years of schooling after six years of primary education. It entails junior secondary (JS) 1, 2 and 3 which makes the UBE culminate in a 9 years of uninterrupted schooling whereby transition from one class to another is automatic through assessed through continuous

assessment (CA). The junior secondary education is quite fundamental because the three years involved is used for grooming the students towards different careers. The potentials of the students are identified and are being tailored towards that direction. Those who show interests in the sciences, engineering and technology are identified, some who can excel in the social sciences, arts and humanities are also fished out while those who show traits in the vocational are equally given tutelage.

Economic Development

The concept of economic development in itself is broad-based and multi-dimensional in nature. According to Kene (2017), economic development means a qualitative change in what or how goods and services are produced through shifts in resource use, production methods, workforce skills, technology, information, or financial arrangements. Thus, development involves a process of economic, political and social change in a progressive direction towards a better social wellbeing for the members of the society (Okobiah and AbdulRaheem, 2018).

It is generally argued that economic development increases the capacity of a nation's economy to create wealth for local residents. For this reason, development depends upon the development of a nation's building blocks such as labour, financial capital, facilities and equipment, know-how, land, other physical resources such as public and private infrastructures (Kene, 2017). Chambers (2020) views economic development as shifting from ill-being to well-being. From the foregone definition of economic development, it is clear that the process of economic development involves growth and other social, cultural

Basic Education and Economic Development

Economic development means different things to different authors, on the bright side, anything a nation does to foster and create a healthy economy can fall under the auspices of economic development. It is the process by which the economic well-being and quality of life of a nation is improved according to targeted goals and objectives (Preece, 2016)

Todaro and Smith (2011) emphasized that education is a basic objective of development; it is an important end to itself. They stressed that education is essential for a satisfying and rewarding life and is fundamental to the broader notion of expanded human capabilities that lie at the heart of the meaning of development.

For a developing nation like Nigeria, education plays a key role in the ability to absorb modern technology and to develop the capacity for self-sustaining growth and development. Thus education is a vital component of growth and development- as input to the aggregate production function. This input role gives education its central importance in economic development. Basic education all over the world is the bedrock for sustainable development because it equips our young people with attitudes and skills like literacy, numeracy and ICT required to sustain our future economic and social development. It is this functional education according to Ali (2012), which will lead to the production of food for the people, create jobs, provide services and lead to an enduring democracy.

The output derived from the education industry shows clearly that the school is knowledge which is desired for the economic improvement it brings to people who have it by way of access to jobs and entrepreneurship. The UBE policy is that there will be free education at the primary school level and first three years of

secondary, but it seems only the primary education is somehow tuition free while fees are still being paid in the junior secondary section. The basic requirement here is to expand classroom space annually to cope with expected students' enrollment, employ and train more staff, etc. these government activities as stressed by Ibe (2012) no doubt play a key role in economic development.

Challenges of the UBE in Nigeria

- a. Inadequate Funding: The funding of the programme is abysmal as noted by the UBE planning and implementation document (Nigeria 2000) which pointed out that the sum of five million dollars estimated for the renovation of existing structures and building new ones has not been disbursed. The implication is dilapidated structures and ill equipped facilities.
- b. Insufficient/Inaccurate Data: Whereas insufficient data looms, our population figures are so politicized as attested by Dare, Onekata and Auwal (2000). This means accessing reliable data for educational planning would be difficult.
- c. Insufficient and Incompetent Teachers: Insufficient teachers mean that a teacher is assigned to more than sixty students whereas the UBE scheme recommended at most forty pupils to a teacher. Lack of training by the government also question the competency of most of the teachers.
- d. Poor Motivation of Teachers: The teaching profession is most relegated to the background in Nigeria. Salaries are not paid as at when due, arrears kept piling and hardly are there incentives for motivation.
- e. Lack of Monitoring/Evaluation: There is no visible activity from the body set to monitor the scheme since its inception in 1999. In this case what the programme is set to achieve and/or whether it has been well implemented cannot be ascertained. Therefore the benefits of the scheme and what should be done to improve and sustain the programme is lacking.

Methodology

The area of study for this work is Calabar Metropolis of Cross River State and the population of study is all the teachers in the government secondary schools in the metropolis. A random sampling technique was used and thirteen teachers were picked at random from ten secondary schools to make a sample size of one hundred of thirty (130). The measuring instrument used by the researchers for this study was the four-point Likert-type questionnaire. The questionnaire was divided into two sections; section 'A' had to do with respondents' personal information while section 'B' is a nine item four point Likert-type questionnaire.

The data collected was analyzed using mean and rank order statistics. To arrive at a criterion or cut off mean, the weighted options were added up as follows:

SA + A + D + SD; where SA = Strongly Agreed, A = Agreed, SD = strongly Disagreed, D = Disagreed.

Which is $4 + 3 + 2 + 1 = 10/4$

= 2.5

Therefore the 2.5 is the criterion mean score. Any item whose mean score falls from 2.5 and above is accepted while the item whose mean score falls below 2.5 is rejected.

Results and Findings

In the presentation of results for this work, the data were represented in the three research questions with the tables.

Research Question 1

Has the financing of UBE in Junior Secondary improved infrastructure?

Table 1		Mean and Rank Order Scores of Respondents' opinions on financing and infrastructure N = 130, X = Mean.						
S/N	Items	SA	A	D	SD	X	Rank	Remarks
1	UBE funds have been properly utilized	10	12	53	55	1.82	1 st	Disagreed
2	The school authority divert UBE funds for other purposes	6	10	30	84	1.52	3 rd	Disagreed
3	UBE funds has helped in building more structures and renovating old ones	8	15	43	64	1.74	2 nd	Disagreed

Source: Authors' computation

From Table 1 above, the mean scores of 1.82, 1.52 and 1.74 all fall below the 2.5 criterion mean score; this implies that respondents disagreed on all the items. That is: UBE funds have been properly utilized, the school authority diverted UBE funds; and UBE funds have helped in building more structures and renovating old ones.

Research Question 2

Are the teachers in the UBE schools well trained and qualified?

Table 2		Mean and Rank of Teachers' response on how qualified the teachers in the UBE schools are, N = 130, X = Mean.						
S/N	Items	SA	A	D	SD	X	Rank	Remarks
1	Teachers are employed based on personal relationship and not based on professionalism	10	12	28	80	1.63	1 st	Disagreed
2	Teachers are being employed for the purpose of the programme	5	15	30	80	1.57	3 rd	Disagreed
3	Teachers are trained periodically	10	10	33	77	1.59	2 nd	Disagreed

Source: Authors' computation

From Table 2 above; all the mean scores fall below the 2.5 criterion mark which imply that the respondents disagreed with all the items that state: Teachers are employed based on personal relationship and not based on professionalism. Teachers are being employed for the programme and teachers are trained periodically.

Research Question 3

Has the UBE program tackled the issue of dropouts in junior secondary schools?

Table 3		Mean and Rank order of teachers' response on the UBE programme tackling the issue of dropouts in junior secondary schools						
S/N	Items	SA	A	D	SD	X	Rank	Remarks
1	The teacher-student ratio is low	60	18	25	27	2.85	1 st	Agreed
2	There is increase in students' enrollment	8	18	33	71	1.71	3 rd	Disagreed
3	Truancy has declined	17	12	42	59	1.90	2 nd	Disagreed

Source: Authors' computation

From the table above the high mean score of 2.85 is above the criterion of 2.5 and therefore means that the respondents agreed that teacher-student ratio is low. On the other hand the mean scores of 1.71 and

1.90 fall below the 2.5 criterion implying that respondents disagree that there is increase in students' enrollment; they also disagreed that truancy has declined.

Conclusion and Recommendations

Countries all over the world seek and desire development in all ramifications and to achieve this, the human resources must be developed through education. The launching of the UBE in Nigeria was to provide a qualitative basic education for all children of school age from primary to junior secondary level.

Although the scheme was conceived to be tuition free, there are cases where the junior secondary level still pays fees (UNESCO 2005), this put a serious question mark on the universality of the programme amidst severe under funding by the government. Nevertheless, if the programme is well implemented and funded appropriately the country will begin to experience a steady economic development and growth. It is against this backdrop that the following recommendations are made.

- The Government Should Increase The Funding Of The Scheme And Adhere To The UNESCO's Standard Of 28% Budgetary Allocation To Education
- The Various States UBE Boards Should Be More Proactive And Seek Assistance From Foreign Partners Like World Bank, UNICEF, Etc. In The Areas Of Story/Text Books And ICT Facilities
- The Government Should Ensure Strict Adherence To The Universality Of The Programme By Ensuring That It Is Completely Tuition Free; Especially In The Junior Secondary Level.

- d. More Classrooms And Desks Should Be Provided And The Issue Of The High Teacher-Student Ratio Be Addressed By Employing More Competent Teachers.
- e. Salaries, Promotions, Trainings And Incentives Of Teachers Should Not Be Toyed With So As To Motivate The Teachers Adequately
- f. Corruption Should Be Tackled Head On So That The Little Funds Allocated To The UBE Would Not Be Embezzled Or Diverted For Other Uses.
- g. School Challenges Like Sports, Debates And Quiz Competitions Should Be Awakened; This Would Create Competitiveness Amongst The Students And Increase Their Zeal To Learn.
- h. There Should Be A Proper Monitoring Of The Programme So As To Ensure That The Goals Of The Scheme Are Not Derailed.

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Technology Intervention in Teaching English for the Integrated Teacher Education Programme—A Minor Study

Dr. Chandrasekharan Praveen

Abstract

As per the guidelines of the National Education Policy (NEP)2020, efforts are underway to launch four year Under Graduate (UG) programmes replacing the three year UG programme. And recently as per the guidelines of NEP, the four year Integrated Teacher Education Programme (ITEP) is being launched in several institutions. It is common practice in many universities across the country to offer English as a compulsory subject of study during the first two semesters. Though not completely matching with existing patterns in university departments, the National Council for Teacher Education in the ‘Suggested Curriculum for ITEP’ for the newly launched BScBED programme, proposed the teaching of the English language during the first semester of the eight semester course.

The investigator was assigned to teach English in the first batch of the ITEP. The newly joined students had cleared a national level test, and were found to be fairly competent in the use of English. So the investigator drawing on a decade long experience of Techno-pedagogy, adapted digital tools to create challenging tasks to ensure student attention and participation while transacting the content.

The paper commences with the background of the study, identifies the need for technology intervention and reports on the strategy employed for integrating social media like WhatsApp and email, and the use of digital tools like videos, visuals, infographics and animated gifs for transacting the content of the paper, ‘English for Communication’. It is hoped that the study would sensitize participants to the scope and possibilities of technological intervention in the newly launched teacher education programme.

Keywords: Communication, Integrated Four Year Courses, NEP 2020, Speaking Skill, Technology Tools

Education has constantly evolved in the last decade. Many teachers have had to adapt to new teaching methods to ensure they have their students’ undivided attention. Assisting them along the way are many digital learning innovations and new tools.

—Target Video

Introduction

The quote above by Brid.TV an international video ad solutions powerhouse, speaks volumes about the changing role of teacher and technology use in the classroom. Chapter 23 of the National Education Policy (NEP)(2020) deals with technology use and integration. The policy suggests the use of technology to improve multiple aspects of education. And recently, taking the cue from NEP 2020, several universities have started offering the four year integrated Under Graduate programme. (1) A perceived objective of the

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newly launched courses is to provide a flexible, multidisciplinary and holistic education model that aims to bridge the gap between the Indian academic system and global education systems.

Background to the study

In tune with the guidelines of NEP 2020, the new Integrated Teacher Education programme was launched in the prestigious National Institute of Technology, Calicut. A total of 38 students registered for the BSc.BEd programme. One the papers prescribed for study in the ‘Eight Semester’ course is ‘English for Communication’ offered during the first semester only. The students had cleared a national level selection test and had scored very high marks for the Plus Two examination. So a large majority of them were above average in terms of English language competence though the entire batch of students happened to be English as a Second Language (ESL) learners. The investigator, a teacher educator by profession had joined as adjunct faculty and is expected to transact the four module component in 39 sessions (2)

The problem

The students who had joined the new BSc BEd programme had prior to joining the course studied English for twelve years. But the ‘English for Communication’ paper prescribed for study during the first semester, matched the B2 (Independent user) level of the Common European Framework of Reference for Languages or the Cambridge English Scale. This was a threat for the teacher because a majority of the learners were found to possess an above average competence in English and the students knew that they would not have to put in serious study to pass the course. So there was every possibility of students displaying a lack of interest and motivation to participate in the classroom tasks. Hence the investigator-cum-teacher had to employ a novel strategy to capture the attention and interest of the learners.

Objectives of the study

The main objective of the study was to identify and use digital tools to motivate students who are above average learners to participate in the class room tasks in the ‘English for Communication’(3) class. To make the pedagogical process effective and ensure whole class participation, the investigator focused on the following objectives:

- Identify and use digital images, to develop speaking skills.
- Identify and use digital images to provide practice in grammar use.
- Identify and use appropriate videos for illustrating concepts related to language.

Method

The population comprised students of the newly launched ITEP who have to complete a course in ‘English for Communication’. The sample comprised 37 students who had cleared a highly competitive entrance examination and sought admission in the National Institute of Technology, Calicut, a top rated institution in India. This qualitative, empirical and analytical study was conducted in the participant observer study mode in which the investigator transacted the content, and also assessed the student-teacher performance

both in the class room and also through online assignments. The data for the study was collected through observation, informal interviews and review of class room performance of the students.

The strategy primarily employed was the use of digital aids - images, videos, animated gifs etc as a prompt to trigger language use by the students. It was in the form of an explorative study aimed at employing digital aids with visual cues to prompt language use in the place of regular print based exercises normally provided in classrooms where communication skills are taught.

Brief Review of studies

On NEP emphasis on use of technology

Reviewing the reference to the use of technology in education in NEP 2020, Indu Kumar observed that achieving quality education in school and teacher education in the country is possible through a meticulous use of information and communication technologies. (ICTs)

On use of technology

Light, who works for the center for children and technology in a post on technology, teaching and learning posted on the UNICEF website opined that technology initiatives must be carefully designed so that it becomes possible for teachers to teach and students to learn in each educational context.

On use of social media

A systematic review of studies on the use of social media as a teaching and learning tool in Higher Education found that in many institutions it is an attractive and contemporary method of teaching and learning. (Perez et al., 2023) Studies conducted abroad have found that the use of social media tools can contribute significantly to academic performance and student satisfaction. (Zhu, 2021) It has also been found that interaction with mentors, building of student communities are all possible when academic institutions utilize social media platforms. (Greenhow, 2011)

On use of videos

A study found that video offers contextual support and/or helps learners to visualize words as well as meanings. (Herron et al., 1995) A study by Çakir (2005) found that the use of audio visual materials stimulate and facilitate foreign language learning. Brame (2016) suggested three elements for effective use of video. These include managing cognitive load of the video, maximizing student engagement and promoting active learning from the video. Goodspeed (2022) while providing tips for showing videos in the classroom observed that movies and videos can be an excellent way to bring diverse stories and voices into the classroom. And Alber (2019) in a post on the use of video content for amplifying learning suggested that in order to keep the students accountable and attentive, commence by setting a goal for what students are about to watch.

On Speaking

Though students score well in written examination, when it comes to speaking many are found to falter. Lack of opportunity to practice English is one reason and practicing teachers of English have found speaking to be a difficult and challenging skill to be mastered. (Brown, 2001)

On learning Grammar

Teachers of English know that many learners find the study of Grammar a bit difficult. Hashemi & Daneshfar (2018) found in grammar teaching an issue that provokes strong feelings and attitudes. Ellis (2009) grouped the difficulties in learning foreign language grammar into three, namely ones associated with environmental factors of language, with linguistic factors and psychological factors.

Technology intervention attempted in the study–Use of different technology-based resources

Illustration : Use of social media tools : WhatsApp, Gmail and Blogs

Right from the initial days of the course, the investigator cum teacher formed a WhatsApp group exclusively for the students. This was then used for self introduction followed by answering of revision questions. Topics for which reference materials were not easily available were shared by the investigator cum teacher using Gmail. Following the answering of the revision questions the complete set of answers were posted in a specially created class Blog. From hindsight it became evident that the use of social media tools enabled transferring of resource materials and foster collaborative learning similar to the studies done in the field in India (Ansari & Khan, 2020).

Illustration : Use of digital images

While choosing photographs, clarity and richness of content vis-à-vis the topic being taught was the prime consideration. This often necessitated ‘weeding out’ or editing pictures downloaded from the Internet. This was consciously done because there was possibility of students focusing on unnecessary details resulting in their deviating from the learning goal. Ibrahim et al. (2012) employed such a strategy for deleting music and complex background from videos and found that such a treatment can improve retention and transfer of new information from video.

Illustration : Use of animated gifs

Animated gifs have the unique ability to focus on essential components to aid comprehension of certain concepts. The display of animated gifs were followed by guiding questions to focus on the concept being presented.

Illustration : Use of videos

Given the fact that videos are rich in content which includes audio, video, and graphics, segmenting or chunking of information was consciously done by the investigator. This was done to enable the learners to engage with small pieces of new information. Such a strategy was found to give control for the learners to process the flow of information. Incidentally a study by Zhang et al. (2006) found that chunking of information is essential for student engagement.

Further, to promote active learning, the videos were paused and questions were posed to ensure that students focus on the concept being taught. Senchina (2011) made use of ‘guiding questions’ when videos were being used to foster learning in a Physiology class and found the strategy to be effective. In fact, the Kaltura report on the state of video in education- 2017 pointed out that 99 percent of institutions have teachers who incorporate video for teaching.

Illustration : Use of infographics

Topics such as ‘Multilingualism’, ‘Language and Culture’, prescribed for study are very broad and for the ‘English for Communication’ course signaling and cueing (deKoning et al., 2009) which involves the use of on-screen text or symbols to highlight important information became essential. This was discreetly done by the investigator to help direct learner attention on particular elements of the infographics displayed which is essential to make the processing of information in the working memory easy.

Discussion and Findings

- A majority of students during an informal assessment were found to be fairly confident in speaking in the class room without any inhibition. But nearly 30 percent of the students were found to show some inhibition in speaking fluently and confidently during the initial assessment. But once the investigator began employing visual tasks which are easy to comprehend which necessitates the student to recognize the visual, identify the relationship between people in the visual, come up with a plausible explanation, even those who tended to remain passive initially were found to provide answers to the questions posed.
- All the participants provided response in the WhatsApp based task and showed an interest in reading and attempting to answer the questions posed both to themselves and their peers. This many opined was something they have never done before during their schooling.
- The class room based tasks were initially a challenge as some of them feared that the errors they make in sentence construction is likely to lower their image before their peers. This was particularly so because they are adolescents and are deeply conscious about their self image.
- Some students were shy to speak, and showed no confidence to express ideas. They needed a class room climate which is stress free, and conducive to learn and use the language without fear of ridicule for making mistakes. The visual based tasks were mostly open ended and did not necessarily have one right answer only. This motivated many students to participate in the tasks provided.
- Many students who were reluctant to speak spontaneously began to follow the teacher’s advice to interact with their peers in English to pick up the language in order to gain competence in language use.
- In schools, the grammar-based tasks which the students attempted was print based exercises. Having to incorporate the grammatical item (Conditionals, Relative clauses etc.) and frame a meaningful sentence was something they had never attempted before. Further when a minimum of five responses were invited for each visual or video displayed, the entire class got an opportunity to see how their own peers varied in terms of linguistic repertoire. This even prompted many to embrace the advice provided by the investigator cum teacher to make reading of texts in English and acquire vocabulary on a daily basis, a habit.
- Informal interviews with the participants found that they found the strategies employed by the investigator novel and while pursuing their schooling they have never had an opportunity to practice grammar in the manner it was taught during the study in NIT, Calicut.
- The students were found to actively participate in the teaching –learning process. Informal interviews revealed that the strategy employed in the classroom inviting open ended responses provided an opportunity for the smart students to provide creative language use. There were instances in which fairly competent

learners provided humorous responses or combined more than one grammar item when asked to provide a response. This indirectly provided an opportunity for peer learning of the nuances of language use.

- One likely reason for active student participation could be that while undergoing schooling, almost all the students were familiar with their teachers of English teachers utilizing the prescribed course book and the student exercise books only for language practice. The digital images and videos which were employed were not only novel but also interesting and alluring.
- The results showed that there was increase in confidence levels to use English in the classroom without inhibition. The use of digital aids such as images and videos were found to invite the student's attention and increase the motivation to learn.

Implications of the study

- The investigator had for almost two decades compiled a series of visuals for language learning and for the study these were profusely utilized. Though the investigator found the strategy employed useful, teachers who intend to employ the same need to be cautious and choose visual aids with discretion. It worth noting the findings of a study on the use of audio visual aids, namely one has to learn from experience what works and will not work for a group of students.(Nurdin et al. , 2019)

Limitations of the study

- The study was conducted on a small sample and the duration of the study is less than 45 days. So it is difficult to fully generalize. More significantly, given the fact that profile and abilities of students who are now pursuing the newly launched ITEP in different institutions in the country widely vary, the advantages identified in the use of digital aids may not work equally well with all students.

Summing up

The study was conducted on prospective teachers of the newly launched four year Integrated Teacher Education Programme in our country. The study has attempted to show how the use of visual based tasks which involved an integration of digital aids motivated the learners to engage in the class room tasks in English even though they were into the thirteenth year of learning and using English. The novelty of the tasks ensured student participation and the strategy employed also instilled the confidence level of learners and helped improve own ability to trigger language use and foster fluency in language use. While summing up, it is worth recalling the 2017 recommendations of the US Department of Education in the National Education Technology Plan Update:

Provide pre-service and in-service educators with professional learning experiences powered by technology to increase their digital literacy and enable them to create compelling learning activities that improve learning and teaching, assessment, and instructional practices(p40).

Declaration of conflicting interests: The investigator cum author would like to declare that there are no potential conflicts of interest with respect to research or authorship for this paper.

Notes

1. As per the new normal, the four year pogrammme will consist of eight semester following the credit-based system.
2. Being a degree awarding autonomous institution, the faculty of the BSc BEd course of NIT, Calicut has the liberty to make necessary changes in the suggested curriculum of the BSc BEd programme prepared by the National Council for Teacher Education. Further, the fact that no text books had been prescribed, the teachers who transact the content has the liberty to identify and use resource materials and even choose appropriate transactional strategies.
3. The four modules prescribed for study in the paper include : i. Language, society and learning ii. Grammar in communication iii. Speaking and pronunciation iv. Critical reading and writing.

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Impact of Social Network on Students' Academic Performance

Joseph Kayode ADEYEMI

Abstract

Students in Nigeria tertiary institutions have now turned their attention to the use of social network for the purpose of studying, conducting research, collaborating and obtaining general information, with more attention given to the internet as a result of its numerous benefits, students who have access to this technology have lost some level of significant interest in using the library. This study specifically investigates the impact of social network on students' academic performance. The findings of the research showed that there is significant relationship between social network and student academic performance. the result revealed that gender has no relationship on undergraduates use of social network and their academic achievement. The study concluded that relevant government authorities and other sponsorship bodies for education should take good measures to create awareness an sensitize students of how and why they use the social networks. Based on the finding, it was recommended that university management should organize a seminar to enlighten students on the not too-good aspects of using social networking sites as media of interaction.

Keywords: Network, Social Network, University, Students, Utilization.

Introduction

It is possible to think of the Internet as a rich, multi-layered, dynamic text for the distribution of information and a platform for cooperative computer-human interaction that transcends geographic boundaries. Today's internet is a global phenomenon whose nature is difficult to define. The internet is often regarded as a vast computer network that connects millions of smaller computers located at several locations across different nations that are owned by thousands of businesses, governments, research, educational institutions, and other organizations. Internet users perceive it as a worldwide society with a vibrant lifestyle. (Emeka & Nyeche, 2016).

Social networks, a collaborative platform that allows individuals from various continents to share ideas and information, are one of the innovations of modern technology. A social network is a group of people or organizations known as "nodes" that are linked by one or more particular forms of interdependency, including kinship, friendship, sexual connections, financial exchange, dislike, or a shared interest (Adeboye, 2012).

A social network can also be defined as a map of specific ties, like friendship, between the nodes under study; the nodes to which an individual is thus connected are that individual's social contacts; the network can also be used to measure social capital, or the value that an individual receives from the social network; social networking sites include: Facebook, WhatsApp, Messenger, Blackberry Messenger (BBM), Google Talk, Google+Messenger, iPhone, Androids, and so on; most people use these sites to communicate with their old

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and new friends, whether they are online or in person (Adeboye, 2012); the development of internet software has also led to the creation of chat sites referred to as “social networks.”

However, lack of regulation of the internet has led to its excessive and abusive use. Mc Quail (2008) stated that more homes are using the internet. Young people conversing in delicate and well-organized settings, such as churches, mosques, and lecture halls, are a frequent occurrence. Some people get so caught up in their conversation that they continue to talk while strolling along the highway. More importantly, the manufacturing and distribution of equally sophisticated cellular phones has complicated the situation, as youths no longer need to visit a cybercafé before they send and receive messages. Attention has been shifted from visible to invisible friends, while important ventures like studying and writing are affected in the process. This phenomenon has become a source of worry to many who believe in knowledge and skill acquisition in the domain of education.

The education industry continues to be one of the largest contributors to the social network. Social networks have functioned as information repositories since the inception of information and communication technology (ICT). Today’s students can access a wide range of it while they study, learn, and conduct research. (Jagboro, 2006).

With over fifty million websites on the internet, it’s likely that, with the right search tools, information on any topic, no matter how obscure, may be located. Additionally, it helps lecturers create lesson plans by utilizing a variety of websites that offer instructional resources. Because curricula can be created collaboratively and educational materials can be distributed and updated more affordably, the internet offers great potential for higher education at all levels and gives students more ways to engage with both their teachers and their study materials. An additional benefit of the internet is that it gives students worldwide though especially those in developing nations access to a vast amount of data.

Online resources can be arranged well, making it simple to access and share information. Greetings, intellectual discussions, meetups, knowledge sharing, emotional support, planning, brainstorming, learning about different cultures, and other mental horizon expansion are all made possible by the internet (Baker, 2000). Students become active learners thanks to the internet’s ability to activate their senses of sight, sound, and cognition. Students can be given access to a wide variety of online activities that will improve their education. Since kids can access any educational database and learn about any nation, it is a two-edged sword. Additionally, they may be exposed to twisted and abnormal subjects. (Hicks, 2005).

Results of Valkenburg (2017) whose three-wave panel survey showed a positive relationship between undergraduates’ (between 10 and 15 years old) social network use. There was no evidence that social network site use significantly increased their social self-esteem, as contrastingly, results from the study yielded support for the idea that higher social self-esteem among participants was correlated with an increase.

Burrows (2017) opined having an ongoing motivation that is self-directed, oriented toward the future, and beneficial to others) acted as a moderator for the impact of feedback on social network on self-esteem. The results of this research provide support for the idea that if parents begin fostering the idea of a sense of purpose in older and younger undergraduates through volunteering, sports, creative arts, clubs, or other activities as they are developing self-esteem, this could potentially act as a moderator between self-esteem

and engaging in social network in adulthood and possibly prove to affect them as they develop through adolescence.

Russello (2009) conducted a study regarding social network has a variety of information, most of which could be beneficial and destructive on self-esteem of young women and men at University. As such it would be of great relevance.

Problem of the Study

Modern books, up-to-date literary materials, and periodicals are insufficiently available in Nigerian institutions due to a lack of funding for their efficient operation, particularly in their libraries. They are now pricey when they are available, as seen by the worldwide political upheavals, economic downturn, and currency devaluation, which are all made worse by the proliferation of knowledge in the global electronic village to which the world has turned. Furthermore, tertiary students in Nigeria are now focusing on using social networks for learning, research, collaboration, and general information gathering.

However, pupils who have access to the internet have lost some degree of major interest in utilizing it as a result of increased attention being paid to. Also, the freedom allotted to internet users which is experienced by these students has also contributed greatly to various internet abuses. Student not only use these social networks for academic purposes anymore but also spend valuable time to watch various obscene views, send misleading information and hate speech, perform internet fraud and so on, which have adverse effect on the academic achievement of undergraduates.

Research Hypotheses

- i. There is no significant relationship between social network and undergraduate's academic achievement.
- ii. There is no significant relationship between the levels of utilization of social network of undergraduates in tertiary institution in Ondo State.
- iii. Gender has no relationship on undergraduate's use of social network and their academic achievement.

Methodology

This study adopted a form of descriptive design that uses a representative sample to collect data for systematic description of existing situation or phenomenon. The population consisted of all the public secondary school students in Akoko South-West Local Government Ondo State. A simple random sampling technique was used to choose the sample for the study. 200 samples of public secondary school students in Akoko South-West Local Government Ondo State. self-structured questionnaire titled "social network and academic performance" on four-likert scale. The instrument was divided into sections; sections A contain personal data of the respondents. While section B contains the item to answer the question raised. Test-retest technique was used and Pearson product moment correlation coefficient was 0.76 which certified that the questionnaire was reliable. Data were analyzed.

Results

H_1 : social network does not significantly predict undergraduate's academic achievement.

Table 1 Social network and undergraduate's academic achievement						
Variable	N	Mean	Df	r-cal	r-tab	Decision
Social Network	102	62.60	198	0.199	0.567	Significant
Academic Performance	88	65.30				

Hypothesis one shows social network and undergraduate's academic achievement. This hypothesis was tested; however the outcome showed that social network predict undergraduate's academic achievement which 0.199 at 0.05 level of significant, the hypothesis is hereby rejected, hence the alternate hypothesis is accepted that there was a significant relationship between social network and undergraduate's academic achievement.

H_2 : levels of utilization of social network of undergraduates in tertiary institution in Ondo State.

Table 2 Showing the social network of undergraduates in tertiary institution						
Variable	N	Mean	Df	r-cal	r-tab	Decision
Level of Utilization	113	32.45	198	0.244	0.567	Significant
Academic Performance	87	25.60				

Hypothesis two shows significant relationship existed between social network and undergraduate's academic achievement, this hypothesis was tested using Pearson Product Moment Correlation; however the outcome showed significant relationship existed between social network and undergraduate's academic achievement. This shows that 'r' is 0.244 at 0.05 level of significant. The hypothesis is hereby rejected since the relationship is high; hence we conclude that significant relationship existed between social network and undergraduate's academic achievement.

H_3 : Gender has no relationship on undergraduate use of social network and their academic achievement.

Table 3 Showing the significant relationship between the levels of utilization of social network of undergraduates in tertiary institution						
Variable	N	Mean	Df	r-cal	r-tab	Decision
Male	100	37.21	198	0.457	0.567	Significant
Female	100	21.60				

Hypothesis three shows gender has no relationship on undergraduates and their academic achievement, this hypothesis was tested using Pearson Product Moment Correlation; however the outcome showed that significant relationship existed between male and female undergraduates use of social network in their academic achievement. This shows that 'r' is 0.457. The hypothesis is hereby rejected since the relationship is high; hence, gender has no relationship on undergraduate's and their academic achievement.

Discussion

Finding of hypothesis one revealed that significant relationship existed between social network and undergraduate's academic achievement. This supports Cusumano & Thompson (1997) who found that the media does have an influence on the both sexes but the sex that it influenced more were the female. This is because female undergraduates were more attracted by pictorial contents and self-revealing gesture.

Finding of hypothesis two revealed that significant relationship existed between social network and undergraduate's academic achievement. This supports Shetata (2017) observes that the middle ages from 18-20 and the young generations are more interested and motivated to make a change.

Finding of hypothesis three revealed Gender has no relationship on undergraduates internet and their academic achievement. It corroborates Blomfield Neira and Barber (1986) who found that compared the levels of those with and without a social network profile and found that females that use social profile demonstrated lower academic performance when compared to those who did not have a profile on a social network.

Conclusion

Social network have impact undergraduates; it has advantages and has greatly increase social relationship among all people. Social network has also make the world accessible to all, and meet people. However, undergraduates has been greatly influenced, most especially full-time undergraduates,

Recommendations

1. Social network usage should be regulated to reduce its negative influence on female undergraduates.
2. There should be age limit in using social network to avoid counter-attack on moral development of female undergraduates.
3. The frequency of use should be reduced.

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Exploring ePathshala Usage and Implementation Challenges in Delhi Schools: An Empirical Study

Dr. Anjali Shokeen and Ms. Aditi Gupta

Abstract

Under the digital India campaign, ePathshala was launched. It was the joint initiative of Ministry of Education (MoE) and National Council of Education Research and Training (NCERT). This paper is focused mainly upon the usage and implementation challenges faced by school teachers of Delhi NCR region. A mixed method research design has been employed. The data was collected through structured questionnaire. The quantitative data suggests the utilization patterns and qualitative data helps in exploring the challenges faced by teachers during the teaching process. ePathshala is an effective educational platform used to assimilate digital content in classroom. It was immensely flourished during COVID-19 pandemic. The findings suggest that teachers use ePathshala resources in their classrooms and integrate into their teaching. But there are certain difficulties that they face while using it. The challenges are related with the internet connectivity, proper training and course content/resource availability. The study concludes by suggesting different ways for the stakeholders to maximize usage potential and to bridge digital divide gap in Indian education system through digital interventions.

Keywords: Digital Indian Campaign, Digital content, Educational Platform, Digital Divide

Introduction

The ePathshala platform was launched in 2015 under digital India campaign by Ministry of Education and the National Council of Educational Research and Training (NCERT). It includes learning resources, audio-visual material, digital books and many other open educational materials. The educational resources available on this portal are user friendly and accessible. During COVID-19, the software has evolved into a fantastic alternative to online learning. Students, teachers and parents can use the technology, it is accessible through tablets, smartphones, laptops, and PCs. In addition, for improving students' critical thinking the instruction and implementation of these multimedia resources are transparent and unbiased. It encourages students to collaborate in groups or pairs to encourage peer learning. To implement the flipped classroom approach, the instructor divides the class into groups and present them a digital content followed by group discussions. Flipped classroom strategy could also be incorporated. A technologically feasible education system that ensures all students receive high-quality, inclusive, and fair instruction. It tries to remove rural-urban divide and socioeconomic or geographical constraints. Making sure that everyone has access to top-notch educational materials.

This application's most significant and adaptable feature is that it can be accessed via web, an Android mobile device, or even an Apple iOS device, which allows it to expand its functionality and reach. The most notable aspect of this is the multilingual help; the materials are available to students in multiple languages. It encourages participation and diversity. Availability of resources such as learning modules, textbooks, and

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teaching related materials makes ePathshala a dynamic source. Since the national education policy 2020 primarily discusses the digitalization of the content available on websites, the ePathshala website and mobile application support the groundwork for digital learning. Scope of life-long learning is provided to the parents as well.

An inventive digital platform called ePathshala was created to improve the educational experience for parents, educators, and students. It offers a variety of curriculum-aligned resources, such as e-books and interactive multimedia. By giving parents access to educational resources, enabling them to monitor their child's progress, and facilitate a contact between their children and teachers. Parents can take an active role in their child's education with the help of ePathshala. NCERT textbooks are available, and anyone can use the ePathshala app or website to learn at their own pace and time. For teachers creating lesson plan, guidelines and e-resources, such as training materials are available. ePathshala teaching aids are incredibly helpful and function as a support system for the teachers.

Need and Rationale

This paper is significant because it addresses the educational resources which are used in classrooms are fair and balanced, essential in promoting critical thinking and scientific inquiry among students. This paper aims to investigate how school teachers, use ePathshala in the classroom. Additionally, if any educator is experiencing difficulties incorporating the resources in classroom. To effectively fulfill the varied requirements of students in an ever-changing educational environment, teachers must constantly refresh their knowledge and abilities. The duty of the school management is to provide instructors with sufficient training and technical support.

Review of Related Literature

Ahmad, M. (2020) aimed towards the effects of COVID-19 and the impact on education, the report discussed government programs like e-Vidya, ePathshala, ePathshala Nishtha, Swayam Prabha, Swayam, and Diksha portals which provide learning material. **Bhat, S. A. (2023)** aimed to offer a comprehensive analysis of COVID-19 and its impact on the teaching and learning processes both in higher education and schools. Associated challenges, which many students faced such as group projects, hands-on courses, and adjusting to new online pedagogies highlighted the need for better technical infrastructure, support networks, and innovative teaching techniques. **Chandra, R. (2020)** studied that students find ease in studying at home using e-learning because to the growing availability of PCs, Android smartphones, and internet networks in remote parts of the nation. The researcher has conducted a thorough comparison of the pre-COVID and post-COVID eras, demonstrating how schooling actually exacerbates the digital divide in the COVID-19 era. **Chandra, R., & Yadav, S. (2020)** conducted study on India's educational model, concerning the creation, growth, and adoption of information technologies that have digitalized all facets of human existence. It also emphasized the advantages of digital learning and the challenges facing the country's transition to a digital India. **Gochade, M. N., Chaudhary, S. E., Kharbe, M., & Nikam, Y. (2021).** examined several issues that professors and students in India face such as a lack of collaborative learning opportunities, time commitment, and effort requirements. For example, some students may reside in rural areas and lack access to mobile phones and internet, which hinders their ability to learn. **Goel, P., & Malik, N. (2021)** conducted study on how aspiring teachers use e-resource portals. It's imperative that e-resource portals and digitalization be

implemented in the fields of research and education. **Jain, P. (2024)** conducted study on the function of nep 2020, the role of libraries, and the effect that libraries have on raising academic achievement. **Jena, P. K. (2020)** examined steps the Indian government took to ensure that education ran smoothly throughout the pandemic COVID-19.

Joshi, D. A. (2021) aimed to examine how students felt about online learning during the COVID-19 pandemic. The study also looks at how technology, usage, and skills affect students' attitudes towards e-learning. **Mahapatra, A., & Sharma, P. (2021)** conducted study on different psychosocial problems that have surfaced cause children and adolescents to experience academic stress and have the potential to cause both short-term and long-term psychological illness. **Nair, N. M., & Londhe, B. M. (2020)** conducted a study on how COVID-19 affects students' attendance in private and public schools. During the lockdown, the government implemented measures in the education sector, including online portals, radio, and television channels to provide students with uninterrupted learning while they are in school. **Parida, A., & Rout, S. (2021)** focused on the problems of secondary school teachers on digital literacy. It studies the digital tools and applications that are used in the classroom to facilitate the easy modulation of concepts. **Patil, M.D., Ghadge, R.B., Dhas, S.D., & Moholkar, A. V. (2021)** investigated the impact of the COVID- 19 epidemic on India's educational system and along with some recommendations for carrying on with classes while the country is under lockdown. **Rajput, N., Chanchal, N., Nisha, & Goyal, A.K. (2020)** investigated relationship among the economy, education, ecology, and society— the three pillars of sustainable development and how they affect each other in making equitable source of living.

Research Objectives

The study has following research objectives:

1. To Identify the Usage Patterns of ePathshala Resources among School Teachers
2. To Find the Challenges Faced by Teachers in Using ePathshala Resources.

Methodology of the Study

The present study is a mixed research method. Two questionnaires were prepared keeping in mind the research objectives. The structured questionnaires were made. The sample selection techniques was random sampling method. Pilot testing was administered on peer teacher educators followed by actual sample. A sample of 40 respondents were randomly selected from Delhi NCR schools. A single research method could not be able to give better results keeping this in mind, mixed research method was adopted. The quantitate method helps in looking at the phenomena of usage patterns, accessibility and effectiveness, on the other hand qualitative data captured the challenges and suggestions which could be added into the numeric data later on.

Findings and Interpretation

The aim of the study is to find out how teachers are incorporating contents and resources of ePathshala platform. The data has been collected from 40 in-service teachers of Delhi NCR region. A structed

questionnaire has been formed using google form. It was then circulated on WhatsApp. The collected data explored the variety of resources used, how often teachers use them, on which device do they use and in teaching which subjects.

Objective 1: To Identify the Usage Patterns of ePathshala Resources among School Teachers

Frequency used: Only (12.5%) of the respondents uses ePathshala resources on daily basis, majority of the respondents which is (70%) rarely uses which makes it less popular among teachers. (17.5%) of the respondents have never used the application. From this it could be interpreted that teachers are not aware about the ePathshala website.

Variety of resources: The resources that are available on the website among them, PDFs (19.44%) are the ones used maximum. After that (33.33%) uses all the resources such as audio-video content and curricular resources. It was also found, that periodicals are the least used resources among all. It could be interpreted that teachers might have their own source form where they use them.

Operating device: The data indicates that website is highly operated on smartphone (22.5%). Though there are many teachers who don't operate this on any of the devices (32.45%). On the other hand, (25%) of the teachers uses on smartphones, tablets/Desktop and laptops. From the above data it could be interpreted that smartphone is the most convenient source of learning. The m-learning model of ICT is observed.

Teaching subject preference: The sources that are available on ePathshala are diverse and broad. It doesn't limit its scope to Single subjects, but accumulate different subjects such as science, math, English, social science and Hindi for classes from primary to secondary. From the collected data it was analyzed that (25%) of the teachers uses it for every subject that they are teaching. (33.33%) of the teachers don't find the ePathshala helpful for teaching any of the subjects. Languages (15%) indicate that website needs to work upon, providing quality of content and creative teaching-learning materials.

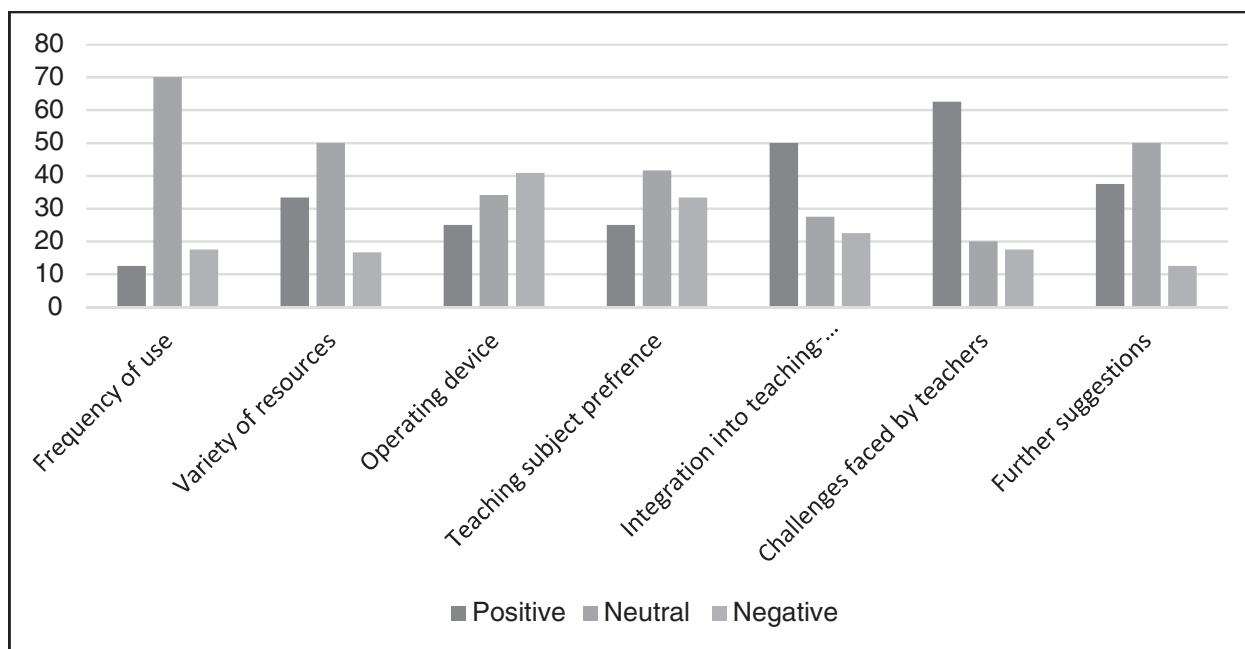
Integration into teaching-learning: There are various methods through which teachers can use ePathshala. It was used in making lessons livelier and provide real life relevance in classroom, (50%) of the teachers believe so. Around (27.5%) of the teachers use the website as a supplement tool to a textbook and try to give extra information using this.

Challenges faced by teachers: (20%) of the teacher's face navigation problem. (15%) of the respondents felt internet connectivity issue. Around (2.5%) of the teachers face language barriers.

Student's response: From the collected data, there are 37.5% of the students who are giving a positive response to ePathshala's integration. Along with it there are only (12.5%) of the students who respond negatively to the contents. (50%) of the students are unsure.

Further suggestions: Out of 40 respondents, (45%) of the participants didn't give any feedback or comments related to the usage, function, or any improvements which are required. (37.5%) of the respondents are not using ePathshala. It is interpreted that teachers don't have any awareness about ePathshala, and are not properly trained.

Visual Representation



Representation Data and its interpretation on Objective 1

Objective 2: To Find the Challenges Faced by Teachers in Using ePathshala Resources.

Experience so far: Out of the 40 respondents there are (50%) of the participants that feel, resources are quite satisfying and fulfill their needs on the other hand there are about (10%) of the respondents who are not satisfied with the experience of the ePathshala platform, meanwhile (40%) of the participants are unsure.

Disruptions in using ePathshala: It is analyzed that (37.5 %) of the respondents feel that there are some internet connectivity issues, a technical barrier which creates problem in the teaching and learning process on the other hand (40%) of the participants did not face any problem. (22.5 %) of the respondents are certainly sure that technical and internet connectivity issue is a hindrance in smooth classroom discourse.

Easy to navigate: From the data that the researcher has analyzed (50%) of the respondents feel that all the contents whether it is audio-video content, eBooks or the curricular resources all are navigation friendly, on the other hand (37.5 %) of the respondents believe that audio and video are best to navigate. (10%) of the respondents feel easy navigation of eBooks and (2.5%) feel navigating curricular resources is easy.

Relevancy with curriculum: (65%) of the respondents believed that resources which are provided on the application are helpful and relevant to the curriculum that they are teaching. (30%) of the respondents are unsure about the relevance of the content. (5%) of the respondents did not find any support from ePathshala resources.

Covers content: Out of 40 respondents (65%) out of them feel that the resources available on ePathshala covers the content entirely. (30%) of them are unsure whether they are able to cover the syllabus using ePathshala resources or not and (5%) of them believe that content available on ePathshala doesn't fulfill the curriculum that they are teaching in their classroom.

Subject specific inefficiency: (45%) of the respondents believed that ePathshala resources is insufficient in providing information related to the subjects like science, math, languages and social science apart from that, (20%) of the teachers believe that subjects like English and Hindi does not have proper amount of content. (5%) of the teachers noticed inadequacy in the content of Social Science and (7.5%) of the respondents feel that science and mathematics are the subjects in which there is a lack of content.

Integration of ePathshala in lesson planning: Out of 40 respondents, (42%) of them agrees that the lesson perfectly aligned with the topics and curriculum which they are teaching, (35%) of them believe that by doing some minor adjustment curriculum is fulfilling their needs. (17%) of them believe that doing some major modifications of the content on ePathshala then they are able to integrate. (5%) of them believe that content is not suitable.

Received Training: When it comes to training (50%) of the teachers receive no training for incorporating ePathshala in classroom. (25%) of them did on their own. (17.5%) of the participants respond that their colleagues helped them. (7.5%) of the total participants are in favor that they were received a formal training from school.

Overcoming challenges for maximum outcome: Out of the 40 respondents (32.5%) of the participants helped students how effectively use ePathshala for learning. (17.5%) of respondents try to integrate the written content with digital media and (7.5%) are in a favor of providing students with the digital copies. (42.5%) of the respondents are in favor that all the methods help them to increase the outcome by minimizing the challenges.

Changes in teaching practice after integrating ePathshala: (15%) of the participants are in favor that by doing some better planning and making their lessons more interactive, help them in developing better teaching learning practice. (7.5%) of the teachers shift their classroom from traditional to ICT based. (10%) of the respondents observed ePathshala does not help in making their teaching lesson more engaging and interesting and (52.5%) of the teachers noticed a major change in student's involvement.

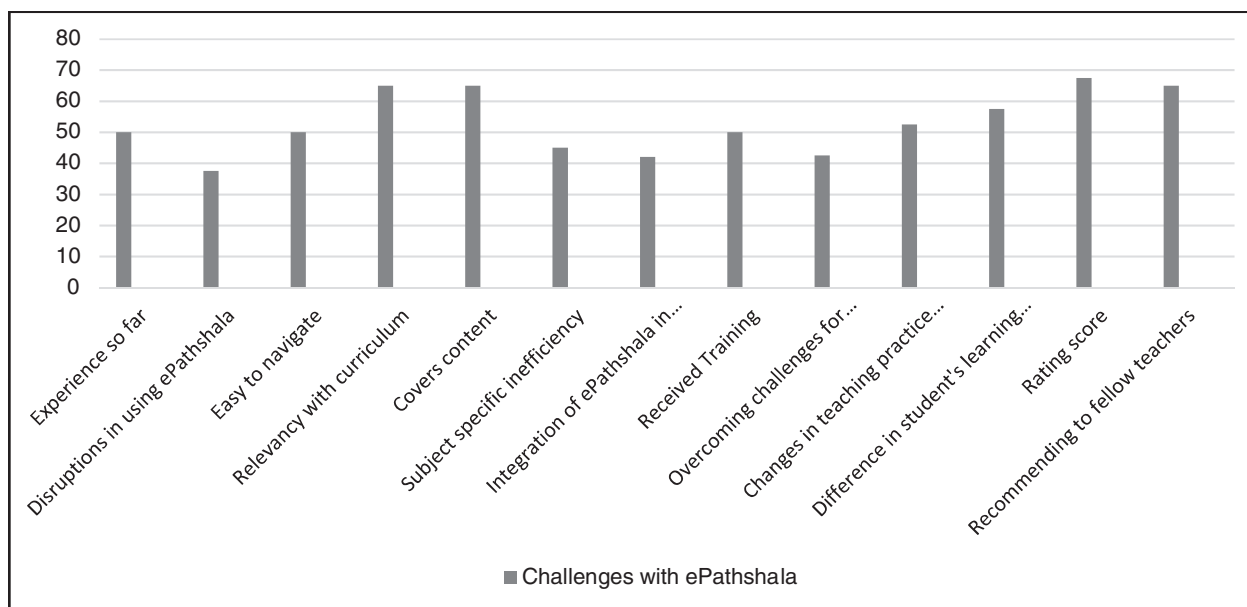
Difference in student's learning outcomes: Out of 40 respondents (57.5%) perceive that there are some noticeable improvements in student's learning outcomes (27.5%) of the respondents believed that by incorporating ICT in classroom there are improvements in student's learning. (12.5%) of the respondents are difficult to assess their students and (2.5%) of the respondents noticed no improvements.

Rating Score: The range of score given to the ePathshala is from 1 to 10 and the most common score which was analyzed was (7) and the average score was (6.95). This could be interpreted that ePathshala has good number of resources.

Recommending to fellow teachers: (67.5%) of the teacher said they will recommend ePathshala to their fellow teachers. (25%) of respondents are unsure whether they should recommend or not, (7.5%) of the population responded that they will not recommend ePathshala to other educators.

Feedback to developers: Around (65%) of the population doesn't have any feedback for the developers, (7.5%) gave positive feedback. (5%) of the respondents are unsure and have no comments to make.

Visual Representation



Representation of Data and its Interpretation on objective 2

Suggestions

It could be suggested that there is a need for providing training to the teachers in digital literacy, it could be arranged for in service teachers. The quality of the content and availability of resources is required to improve; subject specific content is needed to be provided on ePathshala. It is very important to upgrade the technical infrastructure in schools by providing them with better ICT classrooms and smooth internet connectivity. A wide range of languages is a suggestive measure. The resources that are provided on the application should be interactive and engaging, real life examples, experiential learning should be incorporated. Teachers who learnt from their colleagues tend to use ePathshala more effectively and efficiently, so peer learning and collaboration should be encouraged.

Conclusion

The study reveals that ePathshala is a promising website if used efficiently, but many schools are not aware with this. And due to the rigidity of the school administration, teachers are unable to explore diverse digital resources. A multi stakeholder approach is needed to make ePathshala source of core teaching platform. Educators, schools, policy makers, developers and parents should come together and enhance the scope and use of government developed digital resources. Addressing the current challenges with proper interventions will automatically increase reach, inclusivity, flexibility, equity and digital usage for all.

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Technology-Enhanced Education: An Extensive Analysis

Richi Pahuja and Dr. Amit Ahuja

Abstract

In an age driven by technological advancement, social change and unprecedented global competition, the role of education in shaping the future generation has never been more crucial. As we stand on the precipice of a new era with rapid change and complex interactions, the need for learning processes that encourage reactivity, critical thinking and access pressure is gaining importance. Education is the cornerstone upon which the foundation of society is built. It is a catalyst for success, enabling people to reach their potential and making a positive impact on the world around them. But the landscape of education continues to evolve to reflect the dynamic world it seeks to prepare students for.

From the integration of new technologies to the vitality of holistic development, the journey of envisioning the future of education is full of promise and challenges. We cannot follow an academic model of learning that emphasizes just the importance of research or a curriculum that focuses on intellectual development. Instead, we need to take a forward-looking, flexible and inclusive approach. Throughout the course of this paper, we will begin a journey through the technological landscape of education, exploring the diverse array of tools and innovations that have reshaped the educational experience.

Keywords: Technology, Education, Tools, Challenges.

Introduction

The intersection of education and technology has evolved into a dynamic and transformative partnership, fundamentally altering the dynamics of knowledge dissemination and acquisition. This paper aims to delve deeper into this symbiotic relationship and uncover how technology is changing the educational environment. From the emergence of artificial intelligence (AI) to the immersive field of virtual reality (VR), technological innovations have left an indelible mark on traditional educational paradigms, propelling them into the realm of the digital age.

The fusion of education and technology represents a seismic shift in the way information is disseminated and assimilated. Gone are the days when learning was confined within the walls of a classroom or limited to classroom walls or a textbook. Today, the digital realm is like a canvas upon which educators and learners alike can paint their educational journeys, unencumbered by the constraints of time and space. Against this background, this paper attempts to explore the various relationships between education and technology, uncovering the transformative power of innovative technological tools in shaping the future of education.

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As we embark on this review journey, it is imperative to recognize the profound impact of technology on the educational landscape. From the democratization of knowledge to the personalization of learning experiences, technology has ushered in an era of unprecedented access and opportunity. With each technological advancement, the boundaries of traditional learning have expanded and new opportunities for exploration and discovery have opened up.

At the heart of this transformation lies the symbiotic relationship between education and technology. Just as education serves as the catalyst for intellectual growth and enlightenment, technology serves as the enabler, providing the tools and platforms necessary to facilitate learning in an increasingly digital world. Together, education and technology form a synergistic partnership, each reinforcing the other in a perpetual cycle of innovation and adaptation.

Objectives of The Study

Following are the objectives of the study:

- To discuss link between education and technology.
- To explain different tools in education.
- To elaborate the challenges of technology in education.

Research Methodology

The foundation of this concept paper is secondary data that was gathered from a variety of publications, reports and websites.

Linkages Between Education and Technology

The link between education and technology is not merely a superficial connection but also a mutual interaction assimilation leading to the field of learning and teaching. At its core, this relationship is symbiotic, where education provides impetus for innovation and technology and fosters educational progress.

By providing a wealth of tools and resources that improve the educational process, technology acts as a catalyst for innovation in the field. The capacity of technology to offer a customized learning experience is among its most significant features. Technology can customize training and learning materials to fit the needs and learning styles of individual students by modifying learning algorithms and data analysis. Technology maximizes students' chances of academic achievement by enabling them to advance at their own speed through personalized feedback and flexible learning pathways. According to Harris (2016), teachers nowadays are under a lot of pressure to provide children with a quality education based on 21st century standards.

Additionally, by offering channels for communication, cooperation, and knowledge exchange, technology promotes cooperation between students and teachers. By removing geographical boundaries and promoting a sense of community and belonging, technology allows students to interact meaningfully with their teachers and peers through virtual classrooms, online discussion boards, and collaborative document editing tools. The integration of technology and education has enabled freedom of education, removing barriers and providing

access to education that was once limited by physical restrictions. With the proliferation of online courses, open learning, and digital libraries, students around the world can access quality educational content and instruction regardless of their location or experience.

Conversely, education improves learning skills by creating challenges that require new solutions. As educators seek to meet students' diverse needs and adapt to changing learning environments, technology offers solutions that improve teaching and learning. Whether meeting the needs of individualized lessons, facilitating collaboration and communication, or providing instruction, technology is a powerful tool in overcoming barriers to education.

This relationship between education and technology has led to the emergence of various technological tools that meet the needs of education and different areas of interest. From interactive multimedia content and gamified learning platforms to virtual reality simulations and artificial intelligence-driven tutoring systems, technology offers a wealth of resources and opportunities for enhancing the teaching and learning process.

Types of Technological Tools in Education

Artificial Intelligence (AI): Artificial Intelligence (AI) has become a transformative force in education, changing traditional teaching and learning methods. Thanks to AI-driven solutions, learning becomes personalized, flexible and data-driven. Machine learning algorithms analyze large data sets to understand students' learning preferences, strengths and weaknesses. Armed with this information, AI systems can tailor learning content and instruction to meet the unique needs of each student and enable students to receive support and guidance on their own. Whether through adaptive learning platforms or intelligent tutoring systems, AI empowers students to learn at their own pace, thereby maximizing their potential for academic success.

Additionally, AI provides intelligent teaching strategies that give students immediate feedback and support. These systems communicate with students, respond to their inquiries, and offer tailored advice by utilizing machine learning algorithms and natural language processing. AI tutoring systems assist students in overcoming learning challenges and fostering subject-matter mastery by providing prompt feedback and focused interventions.

Through data analysis, artificial intelligence also helps teachers gain a deeper knowledge of students' performance and development. Teachers can decide on curriculum, teaching methods, and intervention tactics with the help of AI systems that analyze student data to find patterns, trends, and areas for development. From a data-driven standpoint, AI enables educators to raise student achievement and enhance learning outcomes.

Cloud Computing: Cloud computing has transformed the educational landscape by providing easy access to educational resources and collaborative collaboration, overcoming geographical barriers and enabling asynchronous learning.

One of the best features of cloud computing in education is the ability to provide teachers and students with easy access to educational content and applications through any device with an Internet connection. Teachers can store, share and access learning materials, resources and tools anytime and anywhere through cloud platforms and services. This change leads to better collaboration, efficiency, and accessibility as teachers and students can instantly collaborate on projects, assignments, and activities regardless of their location.

Additionally, cloud computing can promote collaboration and provide students and teachers with a platform where they can communicate, share and collaborate. Whether through cloud-based data processing tools, collaborative management systems, or virtual classrooms, cloud computing enables collaboration and information sharing, encouraging collaboration, discussion, and action.

Additionally, cloud computing facilitates asynchronous learning, allowing students to access learning and complete tasks on their own quickly and easily. With the help of cloud-based learning management and online courses, students can take independent courses, access multimedia content, and engage in interactive and assessment from the comfort of their home or mobile device.

In summary, cloud computing has revolutionized education by providing access to learning and collaboration, overcoming geographical barriers, and enabling asynchronous learning. By leveraging the power of cloud technology, teachers and students can collaborate, communicate, and learn together in flexible ways that enhance learning skills and increase student achievement.

- **Augmented Reality (AR):** Augmented Reality (AR) has become a powerful tool to enhance interactive learning and encourage deeper understanding and retention.

One of the key benefits of AR in education is the ability to integrate digital content into the physical environment to create interactive learning experiences. Through AR apps and devices, students can interact with virtual objects, animations, and simulations overlaid on real-world objects and environments, bringing abstract concepts to life and making them more educational and practical.

Additionally, AR enables students to engage in learning experiences that encourage exploration, discovery, and critical thinking. AR allows students to explore complex and pressing topics through virtual field trips, interactive science sessions, or historical re-enactments, engaging and interactive, encouraging curiosity, creativity, and problem-solving.

In addition, AR can facilitate deeper understanding and retention of learning content by providing a variety of learning experiences that suit different learning styles and interests. AR enhances collaboration and understanding by integrating visual, audio, and tactile elements into the learning process, thus improving learning outcomes and experiences.

In summary, augmented reality (AR) is revolutionizing education technology and enhancing interactive learning, encouraging deeper understanding and retention. By leveraging the power of AR technology, teachers can create effective and engaging learning experiences that encourage exploration, discovery, and critical thinking, thereby improving learning outcomes and helping students succeed in the digital age.

- **Virtual Reality (VR):** Virtual Reality (VR) has emerged as a transformative tool for enabling experiential learning across various disciplines.

One of the key benefits of VR in education is its ability to transport students to virtual environments that simulate real-world experiences and scenarios. Through VR headsets and immersive simulations, students can explore historical sites, conduct scientific experiments, and interact with virtual objects and environments in ways that would be impossible or impractical in the physical world. This experiential learning approach

promotes engagement, curiosity, and critical thinking, as students are actively involved in the learning process and can apply their knowledge in realistic contexts.

Additionally, VR allows students to engage in collaborative learning that encourages collaboration, communication, and problem solving. Whether through multiplayer VR simulations or virtual projects, students can work together to solve complex problems, share ideas, and learn from each other collaboratively, as well as unite and interact to enhance collaboration and relationships.

Moreover, VR facilitates effective learning by providing students with opportunities to control virtual objects and environments, conduct experiments, and collaborate in problem solving. By participating in experiential learning, students develop their skills, deepen their understanding of abstract concepts, and apply their knowledge to real-world situations, thereby encouraging smart and retention of learning content.

In summary, virtual reality (VR) has revolutionized education by enhancing the teaching experience. By leveraging the power of VR technology, educators can create effective and engaging learning experiences that encourage exploration, collaboration, and active learning to improve learning outcomes, preparing and equipping students for success in the digital age.

- **Mobile Learning and Laptops:** Mobile learning and laptops have transformed the educational landscape by empowering students to access educational resources anytime, anywhere, offering flexibility and convenience.

One of the main advantages of laptops and mobile learning in the classroom is their capacity to provide students with on-the-go access to educational content and resources. With mobile devices and laptops, students can access e-books, online courses, educational apps, and multimedia content from anywhere with an internet connection, allowing for greater flexibility and convenience in the learning process.

Additionally, mobile learning and laptops follow different learning styles and preferences by providing personalized learning experiences. Through interactive multimedia content, gamified learning applications, or online courses, students can collaborate and gain understanding by interacting with the materials in strong, captivating ways that suit their interests.

Additionally, mobile learning and laptops encourage collaboration and communication between students and teachers by providing a platform for discussion, debate and collaboration. Through online meetings, collaborative data curation, or virtual classrooms, students can connect with their peers and teachers in meaningful ways and foster a sense of community and belonging.

How Technology Has Improved Our Education System?

Technology has revolutionized the education system by enhancing accessibility, engagement, and outcomes. It has expanded access to education through online courses and virtual classrooms, breaking down barriers of time and space and reaching students in remote areas or with physical disabilities. Additionally, technology fosters student engagement through interactive multimedia content, gamification, and collaborative platforms, making learning more enjoyable and effective.

Shivakumar (2013) talk about 21st-century education and how technology may be a useful tool for learners. They placed a strong emphasis on working together, integrating blended learning, and utilizing information and communication technology (ICT). ICT encompasses technology that offer telecommunications-based information access. Teachers can become acquainted with technology and some of its problems by utilizing ICT in the classroom.

Technology also makes data-driven decision-making possible, which helps teachers to monitor student development, spot learning gaps, and adapt their lessons to each student's needs. Through the utilization of data analytics and machine learning algorithms, educators can get valuable insights into student performance and modify their pedagogical approaches accordingly, guaranteeing that every student gets the assistance and materials required for success.

Challenges of Technology Integration into Education

Despite the potential for change in technology, the integration of technology into Science and education is not difficult. These limitations must be overcome so that all students can equally benefit from the benefits of technology education.

1. **Digital divide:** One of the toughest challenges facing the integration of technology and education is the digital divide. Lack of access to technology creates educational disparities, especially for students from low-income families or underserved communities. Without access to appropriate hardware, software or internet connections, these students are at a disadvantage and cannot participate in the digital learning environment. The digital divide not only widens the gap between privileged and disadvantaged students, but also increases inequality in education.
2. **Data privacy and cybersecurity:** Another major challenge is concerns about data privacy, cybersecurity, and the use of technology in education. As schools and colleges rely on digital platforms and tools to deliver courses and manage student information, there is a growing need to protect sensitive information and private students. Concerns about data breaches, identity theft, and unauthorized access to student information underscore the importance of implementing cybersecurity measures and following strict rules. Educators should also discuss ethical issues surrounding the use of artificial intelligence (AI) and machine learning algorithms in education. Ensuring the protection and ethical use of student information requires a concerted effort to develop policies, procedures, and procedures regarding the role of technology in education.
3. **Training and professional development:** The lack of adequate training and professional development poses a challenge to the integration of technology and quality education. Many teachers may lack the skills, knowledge and confidence to use technology in the classroom. Without appropriate training and support, teachers may struggle to integrate technology into their teaching, limiting their ability to improve learning outcomes. Providing teachers with ongoing professional development and resources is critical to ensuring they have the skills and confidence to integrate technology into their curriculum.

Conclusion

Educating future generations represents a pivotal opportunity to reimagine the way we prepare the students to cope with the complexities of the 21st century. As we are at the dawn of a new era of rapid technological advancement, global connectivity and unprecedented social challenges, the need for change in education could not be greater. By embracing innovation, promoting equity and prioritizing positive development, we can create a future where every student has the opportunity to thrive and contribute meaningfully to society.

In a rapidly changing and uncertain world, the ability to think, solve problems creatively, and adapt to new situations is critical to success. By giving students the opportunity to explore multiple perspectives, engage in learning experiences, and develop critical thinking skills, we can encourage them to face the challenges of today's world with confidence, perseverance, empathy, and compassion.

In conclusion, the evolution of technology in education cannot be overstated. The emergence of AI-powered self-learning, immersive VR simulations and other technological tools is changing the learning environment, making learning easier, more engaging and effective than ever before. Although challenges such as the digital divide and data privacy concerns remain, the integration of technology and education holds great promise. By using technology responsibly and addressing its challenges, we can pave the way for inclusive, equitable and student-centered education. Technology has the power to liberate education by providing students of all backgrounds with the tools and resources they need to succeed in the digital age. As we continue to realize the potential of technology in education, together we can build a future where every student has the opportunity to reach their potential and achieve fulfillment in a continuous and dynamic world.

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Gender-Based Barriers to Enrollment in Building Technology Education: A Study of Students' Experiences in Hassan Usman Katsina Polytechnic

Umar Abdullahi Mashi

Abstract

The study examined the influence of gender-based barriers to female enrolment in building technology education in Hassan Usman Katsina Polytechnic. There were two specific objectives, two research questions and two null hypotheses for the study. A descriptive survey research design was adopted for the study. The population for the study comprised of all female students from seven colleges in Hassan Usman Katsina Polytechnic. A purposive sampling technique was used to proportionately select one hundred and twelve (112) respondents for the study. The instrument for data collection was a structured questionnaire consisting of 27 items and it was validated by three experts. A reliability coefficient of 0.813 was obtained using Cronbach Alpha. Data collected was analyzed using mean and standard deviation while simple linear regression was used to test the null hypotheses. For taking decision, any item with a mean value of 3.50 and above was considered agreed while any item with a mean value of less than 3.50 was considered disagreed. For the test of null hypothesis, a hypothesis with a P - value < 0.05 significance level was considered accepted while any hypothesis with a P - value > 0.05 significance level was considered rejected. The findings revealed that gender-based barriers and sensitive tasks had significant effect on female enrolment and participation in building technology education. The study therefore recommended that parent should as much as possible be educated to attach equal weights to the education of both male and female children. Moreover, Public enlightenment strategies should be employed to increase female enrolment in Engineering and other Technology related courses, particularly building technology and civil engineering programs.

Keywords: Building Technology Education, Enrolment, Gender-Based Barriers, Sensitive Tasks

Introduction

Technical education means and refers to the integral educational programs of engineering related disciplines that broadly indulged the students in practical skills acquisition, attitudes and theoretical knowledge of technologies related to occupations in various sector of the economy. It covers human abilities to shape and change the physical world to meet the societal needs, by manipulating materials and tools with technique. Undeniably, it is a pathway for a nation to realize its potentials by improving technical abilities and vocational skills necessary for industrial, agricultural and economic development. The main objective of technical education is to provide trained manpower in the industries and other businesses particularly at the craft, advanced craft and technical level. It is also to provide technical knowledge and vocational skills necessary for agriculture, commercial activities and to impart the necessary skills into individuals in order to make them independent and self-reliant. In pursuance of this, Federal Government of Nigeria FGN (2016) declared a

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policy to encourage men and women equally, of all ethnic, racial and economic background to acquire skills in science, technology and mathematics and to have equal opportunity in education, training and employment in scientific and technological disciplines and thereby promoting scientific literacy and technology. The expectation is that, students are provided with experiences predisposing towards acquisition of technical process skills needed for the translation of ideas into a practical method. Technical education is concerned with the development of technological skills and general knowledge which is usually focuses on practical skills that provides an opportunity for students to learn about the technological subjects. Wilson (2023) viewed technical education as an aspect of educational system involving instruction in mathematics, science, technological concepts, directed towards the understanding and ability to apply technological methods in various areas of accomplishments. It is also seen as a study of technology which provides an opportunity for students to learn about the practical skills and knowledge related to technologies that are needed to solve problems and extend human potential (Afu, Gbobo, Ukofia & Itakure, 2017).

Building Technology Education as an aspect of Technical and Vocational Education, is one of the academic programs in Polytechnic, College of Education (Technical) or University in Nigeria. Udeani (2022) asserted that Building technology education prepares students irrespective of their gender to possess hands-on skills and experience to contribute within their society and become self-dependent or self-employed. It is a course of study aimed at producing technicians that are capable of performing basic practices of building technology in both private and public sectors. The study of building technology education enables students to acquire academic, vocational and pedagogical knowledge and skills that would enable them perform well in the industry and in the field of education. National Board for Technical Education NBTE (2021) reiterated that the study of building technology education emphasizes on acquisition of appropriate skills and the development of mental, physical and social abilities and competencies as equipment for the individual to live and contribute to the development of the society. In line with this, Amaewhule (2020) opined that to prepare students to contribute in a contemporary society requires that graduates of building technology education should in addition to workplace skills, inculcate a broad set of higher order thinking skills such as decision-making and problem-solving as well as flexibility, creative thinking and ability to work in a team which would make them adaptable to the dynamic society. A complete education of students of building technology education in the contemporary society therefore must focus on competencies as well as mental skills that will enable them be responsible and be effective problem solvers.

Several studies have shown that there has been substantial increase in female' enrolment and participation in various educational disciplines among Nigerian higher education students. Although, Nigerian female are not getting much needed considerations to compete with their male counterparts in different technical education courses. This is evidenced by extreme low enrolment and participation of the female folks in courses such as Automobile technology, Building technology, Electrical/Electronic technology education, etc, resulting to one or no female student in a class. Hassan (2018) believed that this disparity in enrolment may create unfriendly situation for female students and they may find it difficult to get supported and subsequently feel isolated. In other hand, researchers such as Mark (2017) and Johnson (2016) suggested that low female enrolment in itself is a barrier to female education: hence, on the basis of gender, Federal Government of Nigeria FGN (2016) declared that no person will be excluded from participation or be subjected to discrimination or denied by any means, the benefits of any educational program. This assertion demonstrated the need for protection against discrimination specifically based on gender in educational

institutions. It is also highlighted the need for schools to provide enabling environment for female folks to enroll themselves in any level of educational activity, including technical and vocational education courses. Ayonmike (2014) opined that this affirmation has not been enough to eliminate the stereotype assumptions that technical education courses is for males only. Similarly, despite the changes in successive governments' policy in recent years, it is important to acknowledge that there is still existed low enrolment of female folks in educational institutions offering Technical education courses. For instance, at Hassan Usman Katsina Polytechnic, females' enrolment and participation in building technology education is below expectation. The unwanted trend provided a significant advantage to male folks who have dominated the program. Undoubtedly, this poor enrolment was as a result of negative gender stereotype barriers driven by religious, ethnic, traditional attitudes and norms which were among the subtle barriers that exposed female students to a lower level enrolment and participation in building technology education (Olaitan, 2022). The infamous trends according to Yakubu (2016) have dwindled the Federal Government of Nigeria declaration of equal opportunity for all citizens in education, training and employment in scientific and technological disciplines. It is against this gap, the present study tries to investigate the gender-based barriers to enrolment in building technology education in Hassan Usman Katsina Polytechnic. Subsequently, the study explore the students' experiences and core constraints leading to the female students' low level enrolment and participation in building technology education.

Statement of the Problem

The Enrolment of female in building technology education program in Nigeria's higher institutions is very low when compared to enrolment in other educational program. Despite successive governments' efforts directed at improving Technical Education at all levels to make it attractive and sellable, gender gap still exist. In Katsina state, the education of female children did not receive significant attention, this has led to the second class status assigned to them in the society. Females are relegated to mere agents of domestic engagements, with considerable reproductive roles. This apathy arising from gender influence has affected technical education program particularly building technology education in Hassan Usman Katsina Polytechnic. A closer look at the gross enrollment in the department of technical education between 2020 and 2024 showed gender disparity among students in favors of male students. As a result, the male students have dominated the program and its allied disciplines. However, the National Population Census (2025) projected figures shows that Katsina State has a sex composition almost fifty-fifty (50:50) for males and females, but the educational pendulum tends to swings to the male gender only. This gender-based disparity in enrolment is a source of concern to government, educators and the society at large. Therefore, this study is set out to determine gender-based barriers to female students' enrolment in building Technology Education in Hassan Usman Katsina Polytechnic.

Purpose of the Study

The purpose of this study was to explore the gender-based barriers to enrolment in building technology education in Hassan Usman Katsina Polytechnic. Specifically, the study sought to:

1. Examine the influence of gender on female students' enrolment in Building Technology Education in Hassan Usman Katsina Polytechnic

2. Examine the sensitive tasks that affect female students' participation in Building Technology Education in Hassan Usman Katsina Polytechnic

Research Questions

The following research questions were formulated to guide the study

1. What are the influence of gender on female students' enrolment in Building Technology Education in Hassan Usman Katsina Polytechnic?
2. What are the sensitive tasks that affect female students' participation in Building Technology Education in Hassan Usman Katsina Polytechnic?

Research Hypotheses

The following null hypothesis were formulated and was tested at 0.05 level of significant.

Ho₁: There is no significant difference between mean responses of students on the influence of gender on female students' enrolment in Building Technology Education in Hassan Usman Katsina Polytechnic.

Ho₂: There is no significant difference between mean responses of students on the sensitive tasks that affect females' participation in Building Technology Education in Hassan Usman Katsina Polytechnic.

Research Methodology

The study employed a descriptive survey research design. The population for the study comprised of all female students drawn from the seven colleges (i.e College of Science and Technology, College of Administration and Management Studies, College of Liberal Studies, College of Agriculture, College of Engineering, College of Environmental Studies and College of Vocational and Technical Education) in Hassan Usman Katsina Polytechnic. A purposive sampling technique was used to proportionately select one hundred and twelve 112 respondents for the study. The instrument for data collection was a structured questionnaire consisting of 27 items and it was designed based on the two research questions. The questionnaire was divided into two sections A and B. Section A gathered personal information of the respondents while section B gathered data about the gender-based barriers to female enrolment in building Technology Education in Hassan Usman Katsina Polytechnic. The questionnaire instrument was validated by three experts. The return rate of the questionnaire was 100%. A reliability coefficient of 0.813 was obtained using Cronbach Alpha. The data collected was analyzed using mean and standard deviation. Regression analysis (ANOVA) was employed for testing the null hypotheses using regression statistic at 0.05 level of significance. Four points rating scale of Strongly Agreed (SA), Agreed (A), Disagreed (DA) and Strongly Disagreed (SD) with a rating of 4,3,2,1 were used respectively. For taking decision, mean gain of 3.50 and above was considered to be agreed while a mean gain below 3.50 considered not agreed. For accepting the hypotheses, the computed *p*-value was compared with the significance level of 0.05 for testing the hypotheses. Any hypothesis with a *p*-value of less than 0.05 will be rejected while any hypothesis with a *p*-value greater than 0.05 will be accepted. Statistical Package for Social Science (SPSS) version 23 was used throughout the process.

Result and Analysis

Research Question 1:

What are the influence of gender-based barriers on female students' enrolment in Building Technology Education in Hassan Usman Katsina Polytechnic?

Table 1		Mean rating of the Responses on the Influence of Gender on Female students' Enrolment in Building Technology Education in Hassan Usman Katsina Polytechnic									
S/N	ITEMS	CST $\bar{X}_s$ N=38	CAMS $\bar{X}_s$ N=34	CLS $\bar{X}_s$ N=10	COA $\bar{X}_s$ N=14	COE $\bar{X}_s$ N=2	CES $\bar{X}_s$ N=2	CVTE $\bar{X}_s$ N=12	$\bar{X}_g$	σ	RMKS
1	High level of females involvement in domestic chores/assignments	4.12	4.50	4.00	4.50	4.14	4.50	4.76	4.42	0.85	Agreed
2	Low level of peer support to female students offering courses in Building Technology Education	3.84	4.50	4.38	4.25	4.09	4.50	4.64	4.33	0.74	Agreed
3	Poor societal outlook/psychology that sees the girl-child education as a waste of time and resources since they will not be able to practice their training after marriage	3.52	4.50	4.33	4.50	4.19	4.50	3.94	4.09	0.61	Agreed
4	Lack of a career guidance on development path for secondary school students	3.72	4.50	4.33	4.50	4.19	4.50	3.94	4.97	1.15	Agreed
5	Effects of cultural beliefs/customs toward the female child	4.12	4.50	4.38	4.75	4.66	4.00	4.34	4.34	0.71	Agreed
6	Absence of readily identifiable role models	4.60	4.00	4.00	5.00	4.61	4.00	4.33	4.36	0.83	Agreed
7	Influence of religious biases towards the female child	4.48	3.50	4.00	4.75	4.57	4.00	4.26	4.22	0.71	Agreed
8	The effect of Situational school conditions and environment	4.20	3.50	3.94	5.00	4.28	4.00	4.29	4.33	0.74	Agreed
9	Effect of parents perception and values on the female child education	4.04	4.00	3.88	4.75	4.71	4.00	4.24	4.23	0.72	Agreed
10	Effects of value orientation among the students studying Building Technology Education courses	4.08	4.00	3.88	4.25	3.90	3.50	4.46	4.26	0.71	Agreed
11	The effect of possible dusty sites/work environments on graduation. and the overall bulky nature of most building materials	3.92	3.50	3.94	4.75	4.52	3.50	4.43	4.50	0.92	Agreed
12	The effect of social barriers with the Society in Katsina state	3.92	4.00	4.50	4.50	4.04	3.00	4.62	4.21	0.70	Agreed
13	The effect of working mainly with generally bulky building materials	3.56	4.00	4.44	3.25	4.33	4.50	4.81	4.21	0.70	Agreed
14	The effect of the socio-cultural biases and background of the parents	4.72	4.00	4.33	3.25	4.80	3.00	4.11	4.12	0.63	Agreed
15	The effect of the socioeconomic status of parents	4.56	4.00	4.11	4.25	4.66	3.50	4.28	3.65	0.47	Agreed
	Gran Mean	4.09	4.06	4.15	4.35	4.38	3.93	4.38	4.23	0.60	

KEY: = Standard Deviation, N = 112, g = Grand mean, = Students,

The result of descriptive statistics documented in table 1 indicated that the mean values of all the items ranging between 3.65 and 4.97 with a standard deviation extending from 0.47 to 1.15 and a grand mean of 4.23 respectively. The results agreed that all the 15 items were perceived as the major influence of gender on female students' enrolment in Building Technology Education in Hassan Usman Katsina Polytechnic.

Research Question 2:

What are the Sensitive Tasks that Influence Female Students' Participation in Building Technology Education in Hassan Usman Katsina Polytechnic?

Table 1 Mean rating of the Responses on the Sensitive Tasks that Influence Female Students' participation in Building Technology Education in Hassan Usman Katsina Polytechnic?											
S/N	ITEMS	CST $\bar{X}_s$ N=38	CAMS $\bar{X}_s$ N=34	CLS $\bar{X}_s$ N=10	COA $\bar{X}_s$ N=14	COE $\bar{X}_s$ N=2	CES $\bar{X}_s$ N=2	CVTE $\bar{X}_s$ N=12	$\bar{X}_g$	σ	RMKS
16	Fear of carrying heavy/bulky building materials (e.g. blocks/bricks in the workshop)	3.72	4.00	4.38	3.25	4.16	5.00	4.53	4.33	0.82	Agreed
17	Fear of working with sharp tools in task like cutting, shaping and nailing	4.00	4.50	4.16	4.00	4.42	4.50	4.55	4.35	0.83	Agreed
18	Female students dislike to perform any tasks requiring physical energy	3.48	3.50	3.88	4.00	3.85	3.50	3.89	4.25	0.72	Agreed
19	Female students inert fear of muscular task like mixing of cement	4.36	3.50	4.00	5.00	4.33	3.00	4.15	3.96	0.61	Agreed
20	Most female students dislike working in workshop or construction site that will make them dirty	4.04	4.00	3.83	4.50	3.57	3.00	4.51	4.19	0.71	Agreed
21	Most female students are incapable of enduring persistent long periods at the workshops/sites	4.08	4.00	3.72	4.25	4.42	4.50	4.50	4.28	0.73	Agreed
22	Most female students are more interested in their appearance than male sex.	3.60	4.00	3.61	4.25	3.71	3.50	4.32	4.02	0.60	Agreed
23	Fear of discrimination for working in a male dominated occupation	3.44	4.50	3.66	4.50	4.66	4.50	4.44	3.95	0.56	Agreed
24	Fear of carrying items with their heads in the workshop or construction site	3.96	4.00	4.33	4.00	3.95	2.50	4.32	4.21	0.71	Agreed
25	Building Technology tasks are predominantly muscular in nature and therefore considered as men's occupation by the society.	4.12	4.00	4.33	4.00	3.95	2.50	4.32	4.24	0.72	Agreed
26	Many female students are incapable of performing muscular tasks common in Building Technology Education workshop..	4.00	3.50	3.83	4.00	4.52	4.00	4.12	4.05	0.61	Agreed
27	Several female students are afraid of having to withstand much pressure at work sites	3.84	4.50	4.00	3.25	4.60	2.50	4.02	3.98	0.62	Agreed
	Grand Mean	3.88	3.66	3.60	4.12	4.21	3.67	3.31	4.15	0.68	

KEY: = Standard Deviation, N = 112, g = Grand mean, = Students.

The result of descriptive statistics presented in table 2 indicated that the mean values of all the items ranging between 3.96 and 4.35 with a standard deviation spreading between 0.56 and 0.83 and a grand mean of 4.15 respectively. Therefore, this result agreed that all the 12 items were perceived as sensitive task that influence female students' participation in Building Technology Education in Hassan Usman Katsina Polytechnic.

Hypotheses Testing

Hypothesis One.

Ho₁: There is no significant difference between mean responses of students on the influence of gender on female students' enrolment in Building Technology Education in Hassan Usman Katsina Polytechnic.

Table 3		Regression Analysis of Responses on the Influence of Gender on Females' Students' Enrolment in Building Technology Education in Hassan Usman Katsina Polytechnic.				
Model Summary						
Model		R	R Square	Adjusted R Square	Std. Error of the Estimate	
1		.099 ^a	.010	.001	.49551	

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.268	1	.268	1.092	.298 ^b
	Residual	27.009	110	.246		
	Total	27.277	111			

The result in Table 3 revealed that there was a statistically significant difference between mean responses of students as determined by regression analysis above $R^2 = (.010)$, $f = (1.092)$, $p = (.298)$. Since $p = (.298)$ value is greater than the alpha level of the significance ($p < .05$). The result shows that there was statistically significant influence of gender-based barriers on female students' enrolment in Building Technology Education. This analysis indicates that null hypothesis one was accepted. Therefore, the result support the prediction of hypothesis one that says there is no significant difference between mean responses of students on the influence of gender-based barriers on female students' enrolment in Building Technology Education in Hassan Usman Katsina Polytechnic

Hypothesis 2

Ho₂: There is no significant difference between mean responses of students on the sensitive tasks that affect females' participation in Building Technology Education in Hassan Usman Katsina Polytechnic.

Table 4

Regression Analysis of Responses on the Sensitive Tasks that affect Female students' Enrolment in Building Technology Education in Hassan Usman Katsina Polytechnic.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.081 ^a	.006	-.003	.49635

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.177	1	.177	.718	.399 ^b
	Residual	27.100	110	.246		
	Total	27.277	111			

The result in Table 4 revealed that $R^2 = (.006)$, $f = (.718)$, $p = (.399)$. Since $p = (.399)$ value is greater than the alpha level of the significance ($p < .05$). The result shows that there was statistically significant effect of sensitive tasks that affect females' participation in Building Technology Education in Hassan Usman Katsina Polytechnic. This analysis indicates that hypothesis two was accepted. Therefore, the result support the prediction of hypothesis two that says there is no significant difference between mean responses of students on the sensitive tasks that affect female students' participation in Building Technology Education in Hassan Usman Katsina Polytechnic.

Discussion of the Finding

Based on the findings with respect to the research question one which was supported by test of the corresponding null hypothesis one revealed that there was significant influence of gender-based barriers on female students' enrolment in Building Technology Education in Tertiary Institutions offering technical education program. The results coined with the findings of Ali Muntari (2009) which was focused on gender and social factors leading to the under participation of the female students in Engineering and other Technology Education courses at the university level. The study revealed that enrolment of female students in Engineering and other Technology Education courses at the university level is influenced by gender-based and social factors. In a related study, Afu et al, (2017) investigated the influence of gender on female students' enrolment and participation in Woodwork Technology Education in Federal College of Education (Technical) Gombe, Gombe State. The findings this study revealed that some gender-based factors such as high level of females' involvement in domestic chores/assignments, Low level of peer support to female students offering courses in Woodwork Technology Education, Lack of a career guidance and career development path for secondary school students.

The findings of research question two and the test of its corresponding null hypothesis indicated that sensitive tasks affect female students' participation in Building Technology Education. The findings was in consistent with the arguments in the existing literature, such as the study conducted by Ayonmike (2014) which revealed that female students dislike to perform any tasks requiring physical energy and their inert fear of muscular task

like mixing of cement, carrying heavy materials etc, play a great role on their unwilling attitude to enrolled themselves in Building Technology Education. Moreover, Johnson (2013) proved that sensitive tasks has a significant impact on female students' participation regarding their choice of career in Technical Education. The study affirmed that sensitive activities carried out in Building Technology workshop/Construction site were perceived to be among the subtle barriers that exposed female students to a lower level enrolment and participation in building technology education.

Conclusion

Acquainted with the apparent low level enrolment and participation of female students' in tertiary institutions offering Technical Education program, the study investigated the gender-based barriers that could be dwindling factors that barred female students to develop interest in choosing career path in Building Technology Education. Based on this assertion, it was concluded that factors such as effect of value orientation among the students, low level of pear support to female students' offering courses in building technology education were among the major gender-based social barriers affecting female enrolment in building technology education in tertiary institutions.

Recommendations

Based on the findings of the study, the following recommendations were made.

1. Parents should be educated to attach equal weights to the education of both male and female children. They should be sensitized on the need to enroll their female children in building technology education in tertiary institution offering technical education as a program of study. This could be done by raising their awareness of the link between low education level, poverty, mobility and poor health, which is gender neutral.
2. Public enlightenment strategies should be employed to increase the female gender enrolment in Engineering and other Technology related courses, particularly in building technology and civil engineering where female enrolment remains very low compared to the male counterpart.

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INNOVATIVE SCHOOL EXPERIMENTS

Investigating the Effects of Progressive Task Sequencing on Student Engagement and Achievement in Calculus

Dr. Jonathan Edwin V. Remegia

Abstract

This action research investigated the effects of progressive task sequencing on the engagement and academic performance of 58 Grade 11 STEM students enrolled in Calculus at Talisay Senior High School. Utilizing a mixed-methods approach, the study employed pre-tests and post-tests to evaluate student achievement, alongside a Likert-scale survey to gauge student engagement and perceptions. The intervention entailed the structured application of tasks of increasing complexity, aimed at scaffolding the learning process and improving conceptual understanding.

Quantitative analysis indicated a statistically significant enhancement in student achievement. Furthermore, qualitative feedback from the survey revealed heightened levels of student engagement, improved perceived understanding, and increased confidence. These results imply that progressive task sequencing serves as an effective pedagogical approach for promoting both engagement and achievement in Calculus.

Keywords: Calculus, Progressive Tasks Sequencing, Scaffolding, Student Engagement and Achievement

Context and Rationale

Calculus holds a vital position as one of the fundamental pillars of STEM (Science, Technology, Engineering, and Mathematics) education, serving as a gateway to various advanced fields of study. However, it is not uncommon for students to find the subject particularly daunting due to its inherently abstract nature and the complexity of its concepts. Many learners struggle to grasp the theoretical aspects of Calculus when they are primarily exposed to traditional lecture-based teaching methods. Such methods often fail to cater to the diverse and multifaceted learning styles present in any given classroom. Consequently, this mismatch can lead to a lack of engagement and ultimately result in a diminished academic performance among students, as highlighted by Smith and Johnson (2023) in their recent study.

Considering these challenges, research has increasingly pointed to the significance of active learning strategies as an effective means of fostering improved understanding and engagement in mathematics, including Calculus (Chen and Wang, 2022). Active learning encompasses a variety of instructional approaches that actively involve students in the learning process, prompting them to participate directly through collaborative exercises, problem-solving tasks, and interactive discussions rather than passively receiving information during lectures.

One particularly promising method is task sequencing, which, when crafted with care, can effectively scaffold learning experiences. This approach allows educators to introduce complex Calculus concepts gradually, building up students' understanding in a structured manner (Lee & Kim, 2024).

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At the heart of this scaffolding approach is the idea of providing tailored support to students-initially giving them the guidance they need, which can be gradually reduced as their skills and confidence grow. This principle is essential in mathematics education, as discussed by Wilson and Martinez (2023). When combined with progressive task sequencing, scaffolding breaks down intricate Calculus topics into smaller, digestible chunks.

Such a strategy not only enables students to build upon their prior knowledge but also helps them establish a robust foundation on which to advance their understanding of more complex ideas.

Additionally, fostering student engagement plays a critical role in determining academic success, influencing factors such as motivation, participation, and overall learning outcomes (Garcia & Rodriguez, 2021). High levels of math anxiety can significantly hinder students' ability to engage effectively with challenging subjects like Calculus, accentuating the need for effective pedagogical interventions (Patel and Nguyen, 2025). In today's classroom, where diverse student backgrounds and learning needs exist, the urgency for instructional strategies that enhance student engagement while simultaneously reducing math anxiety cannot be overstated. Designing such interventions is crucial not only for improving educational experiences but also for equipping students with the confidence and skills they need to succeed in their academic pursuits.

Innovations, Interventions, and Strategies

The core intervention was the implementation of progressive task sequencing, which involved the following strategies:

- **Task Decomposition and Sequencing:** Every Calculus topic were examined and divided into a series of tasks, beginning with basic concepts and moving towards more advanced applications. This arrangement was intended to establish a clear progression, enabling students to gradually deepen their understanding (Lee & Kim, 2024).
- **Scaffolded Instruction:** The teacher offered focused help and direction throughout each step of the task, slowly pulling back support as the students became more skilled. This support included straightforward explanations, sample problems, and chances for guided practice (Wilson & Martinez, 2023).
- **Active Learning Integration:** The approach included active learning techniques like working together on problem-solving, teaching each other, and engaging in interactive discussions to enhance student involvement and foster a deeper grasp of the material. Students took part in the learning experience by actively engaging in hands-on activities, allowing them to build their own understanding (Chen & Wang, 2022).
- **Technology-Enhanced Learning:** Students were given chances to practice a get feedback in Calculus concepts through online platforms and interactive tools. The aim was to improve interaction and allow students to study in a way that matched their needs through integrating technology (Kim, 2023).
- **Differentiated Task Complexity:** Tasks were adjusted to match the different learning needs of students, giving everyone a chance to tackle challenges that suited their skill levels. This way, all the students stayed engaged and got the support they needed while learning (Rivera, 2024).
- **Peer Collaboration and Feedback:** Students were encouraged to collaborate and offer constructive feedback on one another's work. Organized activities fostered an environment of peer teaching and learning (Santos, 2022)

The intervention undertaken in this action research encompasses the formulation and execution of a progressive task sequencing strategy for essential subjects within Calculus, including limits, derivatives, and integrals. The design of these sequences was intentionally structured to achieve the following objectives:

1. **Begin with concrete examples:** The initial tasks concentrated on familiar contexts, thereby affording students the opportunity to manipulate and explore the underlying concepts.

Example: Motion and Distance

- **Task 1:**

- “A toy car moves along a straight track with a constant velocity of 2 meters per second for 3 seconds. Draw a graph of the car’s velocity over time. What shape does the area under the graph form? Calculate the area. What does this area represent in terms of the car’s motion?”

- **Output:**

- Graph: A horizontal line at $y = 2$ from $x = 0$ to $x = 3$
- Shape: Rectangle.
- Area: $2 \times 3 = 6$ square units.
- Representation: The total distance traveled by car (6 meters).

- **Task 2:**

- “Now, the toy car’s velocity changes. For the first 2 seconds, it moves at 1 m/s, and for the next 2 seconds, it moves at 3 m/s. Draw the velocity graph and calculate the total distance traveled.”

- **Output:**

- Graph: Two horizontal line segments, one at $y = 1$ and one at 3
- Area: $(1 \times 2) + (3 \times 2) = 2 + 6 = 8$ square units.
- Representation: The total distance traveled is 8 meters.

2. **Gradually build complexity:** Subsequent tasks introduced more abstract representations, necessitating that students apply their understanding in increasingly demanding contexts.

- **Task 3:**

- “The velocity of an object is given by the function $v(t) = t$, where t is time in seconds and $v(t)$ is velocity in meters per second. Draw the graph of $v(t)$ from $t = 0$ to $t = 4$. Estimate the area under the curve using rectangles. How does this relate to the distance traveled?”

- **Output:**

- Graph: A straight line from $(0,0)$ to $(4,4)$.
- Estimation: Using rectangles (e.g., 4 rectangles of width 1), the estimated area will be an approximation of the actual area.
- Relation: The area is an approximation of the total distance travelled.

- **Task 4:**

- “For the velocity function $v(t) = t$, find the exact area under the curve from $t=0$ to $t=4$ using the definite integral. Show your work. How does this compare to your estimation?”

- **Output:**
 - Integral: $\int_0^3 (t^2 + 1) dt = \left[\frac{t^3}{3} + t \right]_0^3 = 12$
 - Comparison: The exact area is 8, and the rectangle estimation should be close to this value.
3. **Foster connections:** The tasks were devised to promote the linkage of various representations (e.g., graphical, numerical, symbolic) and to associate new concepts with previously acquired knowledge.
- **Task 5:**
 - “Given the velocity function , create a table of values for $v(t)$ at $t = 0, 1, 2$, and 3 . Use this table to estimate the area under the curve using the trapezoidal rule. Then, find the exact area using a definite integral. Compare the results and explain any differences. Graph the function and show the areas represented by the trapezoidal rule and the integral.”
 - **Output:**
 - Table: Values of $v(t)$ at given t .
 - Trapezoidal Rule: Approximation of the area.
 - Integral:
 - Comparison: Differences between the trapezoidal rule and the integral due to the approximation.
 - Graph: Visual representation of the area.
4. **Promote reflection:** The tasks incorporated opportunities for students to engage in reflective practices concerning their learning, articulate their reasoning, and substantiate their solutions.
- **Task 6:**
 - “Explain in your own words what the definite integral of a velocity function represents. How does this concept connect to the idea of area under a curve? Describe a real-world scenario where this concept could be useful.”
 - **Output:**
 - Student’s explanation of the integral as total displacement.
 - Connection to area under the curve representing accumulated change.
 - Real-world example: Calculating the total distance a car travels given its velocity profile.

Action Research Questions

1. How does the implementation of progressive task sequencing affect student achievement in Calculus?
2. How does the implementation of progressive task sequencing affect student engagement in Calculus?
3. What are the students’ perceptions of progressive task sequencing as a learning strategy in Calculus?

Action Research Methods

Participants

The study involved 58 students from the 11th grade in the STEM Program who were enrolled in a Calculus course at Talisay Senior High School.

Data Analysis Plan

Quantitative Data: Paired t-tests were conducted to compare pre-test and post-test scores, determining if a statistically significant improvement in achievement occurred. Descriptive statistics were used to analyze survey data, calculating means and standard deviations for each survey item.

Qualitative Data: Qualitative data from the open-ended survey questions were analyzed using thematic analysis, identifying recurring themes and patterns in students' perceptions of progressive task sequencing.

Data Gathering Procedure

Pre-test and Post-test: A pre-test was administered at the beginning of the intervention to assess students' baseline knowledge of Calculus concepts. A post-test, covering the same content, was administered at the end of the intervention to measure student achievement.

Engagement Survey: A Likert-scale survey was administered after the intervention to assess student engagement, perceived understanding, and confidence in Calculus. The survey included items related to student motivation, participation, and satisfaction with the learning experience.

Results and Discussions

Table 1 Pre-Test and Post-Test Results

Calculus Topic	Pre-Test (Mean)	Post-Test (Mean)
Limits	12.00	15.00
Derivatives	19.77	23.26
Integrals	21.25	27.04
Application of Calculus	20.50	23.23
Average	18.38	22.26

The quantitative analysis of the pre-and post-assessment scores indicated as statistically significant improvement in the overall performance of the 58 STEM 11 students following the implementation of progressive tasks. Wright et al. (2022) in their study, highlights the potential of progressive pedagogies to foster a more equitable learning environment by focusing on sense-making rather than rote learning.

Table 2 Test of Significant Difference between Pre-Test and Post-Test Results

Paired Samples Test								
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1 Pre-Test and Post-Test	-3.75250	1.3428	0.69714	-5.97112	-1.53238	-5.383	3	0.013

The analysis reveals a statistically significant difference between pre-test and post-test scores following the implementation of a progressive task sequencing intervention, with a probability value below the 0.05 significance level indicating performance improvement. This suggests that the changes are not merely due to chance, thus affirming the intervention's effectiveness.

Both theoretical and empirical evidence supports these findings. The intervention aligns with Cognitive Load Theory (CLT) by systematically managing cognitive load, breaking down complex tasks into smaller, manageable steps, which minimizes extraneous cognitive burden and optimizes cognitive resource allocation for schema construction and automation. The significant improvement in post-test scores aligns with CLT predictions, indicating that the intervention facilitated efficient cognitive processing and learning.

Furthermore, Vygotsky's sociocultural theory, particularly the concepts of scaffolding and the zone of proximal development (ZPD), underpins the intervention's success. The gradual increase in task complexity reflects the removal of scaffolding, enabling learners to transition from assisted performance to independent mastery, thereby reinforcing the efficacy of this scaffolded learning approach.

Extensive research in skill acquisition supports the effectiveness of progressive practice techniques. Studies in various domains, including motor and cognitive skill development, show that deconstructing complex skills into sequential steps enhances performance and retention. The current study's intervention aligns with this principle, providing a rationale for the observed improvement.

Additionally, the incremental nature of the intervention embodies the principles of mastery learning, emphasizing proficiency in foundational concepts before advancing to more complex material. The significant improvement observed indicates the intervention's effectiveness in facilitating mastery learning, thereby establishing a solid foundation for subsequent learning.

Table 3 Student Perception of Progressive Tasks

Survey Statement	Mean Response	Standard Deviation
I felt more engaged in Calculus class when we work on progressive tasks.	4.3	0.7
The progressive tasks help me understand Calculus concepts better.	4.0	0.8
I enjoyed working on the progressive tasks.	4.2	0.6
The progressive tasks helped me improve my problem-solving skills in Calculus.	3.9	0.7
I would like to see more progressive tasks used in Calculus class.	4.1	0.8

The findings from the student survey revealed an affirmative view of the progressive task as a pedagogical strategy. The statement receives the highest mean score of 4.3 was, "I felt more engaged in Calculus class when we worked on progressive tasks." Clark & Roche (2018) highlight in their research the importance of tasks that are relevant to the context and systematically escalate in complexity to improve student engagement.

Qualitative Findings

- **Theme 1: Scaffolding and Gradual Learning:** Students valued the way the tasks were structured, enabling them to develop their understanding step by step. “The assignments began with simpler ideas and then slowly became more complex,” one student mentioned. “This approach really helped me understand the basics before facing tougher challenges.”
- **Theme 2: Deeper Understanding:** Many students believed that the step-by-step tasks helped them gain a better grasp of the concepts. One student remarked, “I didn’t just memorize the formulas; I really understood how they work.” Another added, “These tasks encouraged me to think critically about the fundamental ideas.”
- **Theme 3: Increased Confidence:** As the students worked through the assignments, they became more self-assured in their calculus problem-solving skills. One student admitted, “I was really intimidated by Calculus at first, but the tasks gradually helped me gain confidence bit by bit.”
- **Theme 4: Time Commitment and Effort:** Several students indicated that the progressive assignments demanded considerable time and effort. One student remarked, “It required a lot of time to complete the tasks, but ultimately, it was worthwhile.”
- **Theme 5: Value of Feedback:** Students highlighted the significance of obtaining prompt and constructive feedback on their assignments. One student remarked, “The teacher’s feedback was beneficial. It allowed me to recognize my errors and learn from them.”

Triangulation and Integration

The quantitative and qualitative data combined to create a compelling illustration of the beneficial effects of progressive tasks.

Convergence: The marked enhancement in conceptual understanding and problem-solving abilities identified in the quantitative analysis was reinforced by qualitative findings, which indicated that students perceived the tasks as instrumental in promoting a deeper comprehension and bolstering their confidence. The qualitative insights elucidated the reasons behind the improvements observed in the quantitative scores.

Complementarity: The qualitative data offered valuable perspectives on the student experience, including the significance of scaffolding, the required time commitment, and the importance of feedback. These elements were not adequately captured by the quantitative assessments.

Discrepancy/Challenge: Although the overall findings were favorable, a possible discrepancy emerged regarding the time commitment involved. Students recognized the necessity of time investment but generally considered it to be worthwhile. This nuanced understanding of the time commitment was not fully represented by the quantitative data, which primarily concentrated on pre- and post-test scores. This discrepancy encouraged a deeper examination of how to balance the advantages of progressive tasks with the potential demands on students’ time and workload. Future iterations may benefit from exploring strategies to optimize task design to enhance learning outcomes while effectively managing time constraints.

Discussion

This research emphasizes the benefits of using progressive tasks in Calculus. The quantitative results present compelling evidence of enhanced conceptual comprehension and problem-solving abilities, while the qualitative findings shed light on the students' experiences. The convergence of these findings enhances the credibility of the conclusions drawn. The outcomes indicate that progressive tasks can serve as an effective teaching method for fostering deeper learning and increasing student engagement in Calculus.

Conclusion

This research integrates both quantitative and qualitative data, offering an in-depth analysis of the influence of progressive tasks within the context of Calculus. The results indicate that this methodology may significantly enhance student learning outcomes. Subsequent studies could examine the enduring effects of progressive tasks and assess their relevance across various mathematical disciplines. Additionally, exploring strategies for optimizing the design and execution of these tasks could be beneficial in maximizing their advantages while managing potential challenges, notably the demands on time that such tasks may entail.

Recommendations

According to the results of this action research, it is proposed that the application of progressive tasks as a pedagogical strategy in Calculus courses should be maintained and further developed. The notable enhancement in student assessment scores, along with the favorable trends identified in student engagement, conceptual comprehension, and student perceptions, provide substantial evidence for the efficacy of this approach.

To ensure the ongoing and successful execution of progressive tasks, it would be helpful to provide mathematics teachers with professional development opportunities focused on creating, facilitating, and evaluating these tasks. This could involve training on strategies for scaffolding, offering constructive feedback, and managing group work effectively.

Future studies might examine the enduring impacts of incorporating progressive task in Calculus on students' educational paths in later mathematics and STEM disciplines. Additionally, analyzing the efficacy of distinct types of progressive tasks for tackling specific learning difficulties in Calculus could yield significant insights beneficial for curriculum design and teaching methodologies.

Future action research efforts might benefit from a more direct integration of student perspectives during the design and evaluation stages, thereby further empowering participants and improving the significance and efficacy of the interventions.

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Before the Books Open: Cultivating Joy, Mindfulness, and Peace in Schools

Dr. Santosh Vyas

“Education should not be about moulding children the way we want them to be, but about supporting them to become who they are meant to be.”

— John Dewey

The terrarium of peace within a school ecosystem is not built on discipline alone but on joyful learning. A pedagogy that embeds happiness, patriotism, self-awareness and mindfulness transforms the school into a microcosm of an ideal society- one where conflicts are resolved not through authoritarian imposition of the code of conduct but by engineering spaces where new colloquies germinate, perspectives intersect and solutions thrive - turning friction into fuel for progress. By making learning an immersive experience, schools cultivate a culture of intellectual confluence where curiosity supersedes aggression and collaboration replaces discord.

Traditional didactic instruction often creates a schism between the learner and knowledge. However, when the classroom transforms into a dynamic space where joy becomes the conduit of learning, education ceases to be a burden and emerges as an adventure. Joyful learning pedagogy does not merely deliver content; it writes narratives that foster emotional intelligence, resilience and harmony.

The Happiness Curriculum, initiated by the CBSE under the National Education Policy (NEP), revolutionizes classroom dynamics by focusing on the well-being of students. It beats a hasty retreat from rote learning to experiential knowledge, ensuring that emotional intelligence is as diligently cultivated as academic proficiency. By engaging in storytelling, reflective practices and unmapped discussions, students develop empathy- an essential ingredient for a peaceful school environment.

Parallely, the Deshbhakti Curriculum, with its emphasis on civic consciousness and national pride, instils national pride and awakened consciousness. Patriotism, when fostered through meaningful engagement rather than didactic imposition, nurtures respect for diversity and social cohesion. When students perceive themselves as integral fibre in the national fabric, conflict dissolves into a unifying vision.

Modern neuroscience underscores the critical role of mindfulness in emotional regulation. Vipassana, an ancient meditative practice, is seamlessly integrated into our school’s morning routine. This practice acts as the neural microprocessor of peace, training students to modulate their emotions rather than react impulsively. Studies suggest that structured mindfulness interventions reduce aggression and enhance problem-solving skills, making Vipassana an indispensable tool in school environments seeking harmony. The shift from punitive discipline to self-regulation fosters an internal locus of control. When students engage in guided Vipassana sessions, they cultivate metacognition—the ability to step back and assess their reactions. As a

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result, conflicts become less about retaliation and more about resolution. Schools that incorporate meditation report significant decline in behavioural disruptions, substantiating the role of introspection in tangible peace.

Competition as the primary driver of success is gradually making way for collaboration and team work. When students work in teams, they learn the art of negotiation, active listening and decision making, much like a relay race where victory depends on baton-passing and cumulative effort rather than individual speed alone. The CBSE guidelines on experiential learning emphasize structured teamwork as a pedagogical tool that not only enhances cognitive development but also ingrains social harmony.

Toy pedagogy, another innovative approach, taps into the intrinsic playfulness of children to make learning an intuitive process. The use of indigenous toys, puzzles and interactive kits aligns with the NEP's vision of integrating creativity with conceptual clarity. When students engage with learning material in a playful manner, their energies are directed towards exploration rather than disruption. The neurochemical shift from stress-induced cortisol to curiosity-driven dopamine ensures that schools become spaces of connection rather than confinement.

A school is not an isolated entity; it is a microcosm of the civilized human establishments, called as 'society'. When the learning environment fosters concord over discord, the reverberations extend beyond the campus walls. The CBSE manuals advocate for a holistic-school approach, wherein pedagogy, infrastructure and policies converge to create a culture of peace. When students internalize values of empathy, compassion and justice, they do not merely become better individuals—they become architects of a cohesive citizenry.

The journey towards peaceful schools is not a utopian ideal but a tangible reality shaped by intentional pedagogy. Joyful learning, with its amalgamation of happiness, patriotism, conscious awakening and play, rewires the neural pathways of students towards constructive engagement. When education moves beyond mechanical instruction to a lived experience, conflict becomes an opportunity for growth rather than a trigger for division. Schools, as the rehearsal halls for the grand stage, hold the blueprint for a world where peace is not a mandate but a choice.

The quest for a conflict-free society must originate at its very foundation- within the formative sanctum of the school, where the seeds of friendship and togetherness are first sown.

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Problem Solving Method in Teaching of Mathematics (Trigonometry) at Secondary Stage

Ms. Preeti Anand

Abstract

This research examines the impact of the problem-solving approach on improving performance in Mathematics among secondary school students. Drawing on established problem-solving models, including variations of Polya's well-known four-step strategy (comprehending the problem, planning a solution, executing the plan, and reviewing the results), the study investigates how the structured use of such techniques influences students' conceptual grasp and academic success in Mathematics.

Adopting a quantitative research design, the study utilizes a sample of secondary-level learners and applies both descriptive statistics and regression analysis to assess the relationship between problem-solving instruction and academic performance. The results indicate a strong positive correlation, showing that implementing problem-solving methods significantly enhances student achievement. This improvement is attributed to the promotion of deeper understanding, strategic reasoning, and the ability to interrelate mathematical concepts.

Furthermore, the study finds that problem-solving strategies contribute to more favourable student attitudes toward Mathematics and foster the development of higher-order thinking skills. These skills are vital for addressing complex problems both in academic settings and real-life scenarios. The findings emphasize the value of embedding problem-solving techniques into the secondary Mathematics curriculum to improve educational outcomes and better equip students for future mathematical challenges.

Problem solving method refers to a structured, step-by-step approach used to identify solutions to specific challenges or issues. It's a way of thinking and working through problems methodically to reach a resolution. This method is used in everyday life, education, business, engineering, science, and more.

Keywords: Problem-Solving Method, Mathematics Education, Academic Achievement, Conceptual Understanding, Quantitative Research, Higher-Order Thinking

Introduction

This research involved two groups, **each comprising 20 students, who were randomly selected from two separate Grade 10 sections at Ramakrishna Senior Secondary School**, located in Vikaspuri, New Delhi. The institution is known for its inclusive approach to education and serves a wide-ranging student body from the surrounding neighbourhood, reflecting a mix of cultural, social, and academic backgrounds. This diversity provided a rich context for evaluating the effectiveness of the teaching method under study.

Mathematics is more than a collection of numbers, symbols, and formulas—it is a foundational discipline that nurtures logical reasoning, analytical thinking, and practical problem-solving abilities. Despite its significance, many secondary-level students struggle to grasp mathematical concepts, often leading to poor performance in assessments. This persistent issue has urged educators and researchers to seek innovative teaching strategies that can make Mathematics more engaging and comprehensible.

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One such approach gaining recognition is the **problem-solving method** of teaching Mathematics. Unlike traditional instructional methods that emphasize memorization and repetitive procedures, the problem-solving approach fosters active student participation, critical thinking, and contextual application of knowledge. It encourages learners to explore concepts, pose and test hypotheses, reflect on outcomes, and develop deeper conceptual understanding. This method not only enhances academic performance but also builds learners' confidence and independence in approaching mathematical problems.

This research paper investigates the effectiveness of the problem-solving method in teaching **Trigonometry** to Grade 10 students. The study aims to evaluate whether **this instructional strategy significantly improves students' understanding, reasoning skills, and performance when compared to conventional teaching methods.**

Research Objectives

1. **To identify** specific problem-solving strategies that contribute most to students' success in Trigonometry.
2. **To assess** the effectiveness of the problem-solving method in improving students' understanding of trigonometric concepts.
3. **To contrast** the academic performance of Grade 10 learners taught through the problem-solving method with performance when the same learners taught through conventional approach.
4. **To investigate** students' attitudes and engagement towards learning Trigonometry when taught using the problem-solving method.

General Steps followed in Problem Solving Method:

1. **Identify the Problem**
Clearly understand and define what the actual problem is.
2. **Gather Information**
Collect relevant data, facts, and context related to the problem.
3. **Analyze the Problem**
Break the problem down into smaller parts and identify root causes.
4. **Generate Possible Solutions**
Brainstorm multiple ways to address or solve the problem.
5. **Evaluate and Select the Best Solution**
Compare options, considering pros, cons, risks, and resources.
6. **Implement the Solution**
Put the chosen solution into action with a clear plan.
7. **Monitor and Evaluate the Results**
Check if the solution worked. If not, make adjustments or try another approach.

Hypotheses:

Null Hypotheses:

H_{01} : There is no significant difference in the Mathematics performance of Class 10 students taught using the problem-solving method and those taught using traditional methods.

H_{02} : There is no significant difference in conceptual understanding of mathematical concepts between students taught through problem-solving and those taught through traditional instruction.

H_{03} : The problem-solving method has no significant effect on students' engagement or attitude toward learning Mathematics in Grade 10.

Research Hypothesis / Alternative Hypothesis:

H_A : "The use of the problem-solving method in teaching Trigonometry significantly enhances the conceptual understanding and problem-solving skills of Class 10 students compared to traditional lecture-based instruction."

Methodology

Problem-Solving Strategies for teaching Trigonometry at Secondary Stage

Research Design

This study follows a **pre-experimental (pre-test) and post-test design**. The aim is to evaluate the effectiveness of the problem-solving method in teaching Trigonometry by measuring the academic performance of two groups of Grade 10 learners before and after the intervention.

Participants

The participants of this study consisted of **Grade 10 students** from Ramakrishna Senior Secondary School. A total of **40 students (two groups of 20 students each)** from two different sections were selected using purposive sampling.

Instructional Procedure

The teaching intervention was carried out over a period of **4 weeks**, covering essential topics in Trigonometry from the Grade 10 Mathematics syllabus. All students received instruction first using conventional approach and gave a pre- test and then using the problem-solving method during the research followed by a post – test.

Lessons were designed to incorporate various **problem-solving strategies**, such as:

Real-life application problems:

- 1) Architecture: Calculating roof heights using elevation angles
- 2) Navigation: Finding distances between two points using angles
- 3) Surveying: Measuring inapproachable heights(e.g., trees, structures)

Group-based problem discussions

Group-based problem discussions are collaborative learning activities where students work in small groups to **analyze, discuss, and solve trigonometric problems**. The goal is to promote peer learning, deepen conceptual understanding, and build confidence in applying Trigonometry.

Benefits:

- Encourages **cooperative learning** and peer teaching
- Enhances **conceptual clarity** through multiple perspectives
- Builds **communication and reasoning skills**
- Increases **engagement and participation**
- Helps identify and correct **misconceptions**

Guided discovery and exploration

Guided discovery is a teaching strategy where the teacher leads students to uncover key trigonometric concepts through **carefully designed activities, questions, and explorations**—rather than directly telling them the rules or formulas. It encourages **active learning, critical thinking, and conceptual understanding**.

Trigonometry often involves abstract concepts and formulas (like $\sin$, $\cos$, $\tan$). Guided discovery helps students:

- Understand **why** formulas work, not just memorize them.
- See patterns and relationships in triangle geometry.
- Build a **deeper and longer-lasting understanding** of concepts.

Use of visual aids and hands-on activities

Visual aids and hands-on activities help bridge the gap between abstract trigonometric concepts and students' understanding by making learning **tangible, interactive, and visual**. Examples are :

Right Triangle Diagrams: Help students visualize opposite, adjacent, and hypotenuse sides in context.

Trigonometric Ratio Charts: Show values of sine, cosine, and tangent for standard angles (0° , 30° , 45° , 60° , 90°).

Animations or Videos: Show dynamic changes in angle size and corresponding ratio values.

Reflective questions and student-generated solutions

Reflective questions are open-ended prompts that guide students to:

- Think about their learning process
- Justify their reasoning

- Connect concepts
- Identify errors or alternative approaches

Examples in Trigonometry:

- “Why do you think sine increases as the angle increases from 0° to 90° ?”
- “What would happen to the value of cosine if the angle increases beyond 60° ?”
- “How can you decide whether to use sine, cosine, or tangent in a word problem?”
- “Is it possible for two triangles to have the same sine value but different side lengths? Why or why not?”
- “What mistake do you think someone might make when solving this problem, and how would you correct it?”

Benefits:

- Encourages **metacognition** (thinking about one’s own thinking).
- Improves **conceptual clarity**.
- Promotes **discussion and reasoning**, not just computation.

The goal was to actively involve students in the learning process and to encourage deeper understanding and critical thinking.

Data Collection Tools

1. **Pre-test and Post-test:** Designed to assess students’ knowledge and understanding of Trigonometry before and after the problem-solving intervention. Both the tests were standardised (verified by subject experts). Even the level of post Examination was kept difficult and highly competency based.
2. **Classroom Observation Checklist:** Used to monitor student engagement, participation, and response to the problem-solving approach during lessons.
3. **Student Feedback Questionnaire:** Collected qualitative data on students’ perceptions, challenges, and overall experience with the problem-solving method. Use performance tasks (e.g., “Measure the height of the school building, flagpole using Trigonometry”).

Data Analysis

Quantitative data from the pre-test and post-test were analyzed using **descriptive statistics** (mean and standard deviation) and **paired t-test** to determine whether there was a statistically significant improvement in students’ performance. Qualitative feedback from observations and standardised tests was analyzed thematically to support the interpretation of the results.

Paired t test results (FOR THE SAMPLE TAKEN FROM STUDENTS OF CLASS XA1) Refer Appendix I

Article 12

P value and statistical significance:

The two-tailed P value equals 0.0067

By conventional criteria, this difference is considered to be very statistically significant.

Confidence interval:

The mean of Test 2 - Test 1 equals -2.65

95% confidence interval of this difference: From -4.47 to -0.83

Intermediate values used in calculations:

$t = 3.0411$

$df = 19$

standard error of difference = 0.871

TEST	TEST 1	TEST2
Mean	13.05	15.70
SD	6.99	4.96
SEM	1.56	1.11
N	20	20

Paired t - test results (FOR THE SAMPLE TAKEN FROM STUDENTS OF CLASS XA3) Refer Appendix II

P value and statistical significance:

The two-tailed P value is less than 0.0001

By conventional criteria, this difference is considered to be extremely statistically significant.

Confidence interval:

The mean of Test2 minus Test 1 equals -5.85

95% confidence interval of this difference: From -8.06 to -3.64

Intermediate values used in calculations:

$t = 5.5346$

$df = 19$

standard error of difference = 1.057

TEST	TEST 1	TEST2
Mean	9.65	15.50
SD	5.22	3.43
SEM	1.17	0.77
N	20	20

Results

The analysis of the pre-test and post-test scores (Appendices I and II) revealed a **significant improvement** in students' performance after the implementation of the problem-solving method. The **mean score** of the post-test was notably higher than the mean score of the pre-test. The **paired t-test** results showed a statistically significant difference ($p < 0.05$), indicating that the increase in scores was not due to chance.

Observational data confirmed higher levels of **student engagement, participation, and collaboration** during lessons that incorporated problem-solving activities. Furthermore, student responses from the feedback questionnaire indicated that most learners found the method more **interactive, meaningful, and enjoyable** compared to previous learning experiences.

Common themes from student feedback included:

- Better understanding of trigonometric concepts through real-life applications.
- Increased confidence in solving problems independently.
- Greater interest and motivation to learn Mathematics.

Conclusion

The findings of this study suggest that the **problem-solving method is an effective instructional strategy** for enhancing the understanding and academic performance of Grade 10 students in Trigonometry. The method not only led to measurable improvement in test scores in both the groups but also fostered greater student engagement and positive attitudes toward learning. So, the null hypotheses has been rejected.

By **emphasizing critical thinking, real-world applications, and active student involvement**, the problem-solving approach addresses many of the limitations of traditional lecture-based instruction. Based on these outcomes, it is recommended that Mathematics educators incorporate problem-solving techniques into their regular classroom practice, especially when teaching abstract and complex topics like Trigonometry.

Further research could expand on this study by involving larger samples, longer intervention periods, and comparative analysis with other teaching methods to validate and generalize the results. The study of quasi-experimental **design** with a control group and an experimental group can also be considered.

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Appendices

APPENDIX - I

CLASS 10 A1, COMPARISON OF THE TWO TEST SCORES IN THE SAMPLE OF 20 STUDENTS

S. No.	Name	TEST1 (PRE -TEST) 25 marks	TEST2 (POST- TEST) 25 marks	DIFFERENCE
1	A	14	14	0
2	B	16	17	1
3	C	18	22	4
4	D	19	15	-4
5	E	23	24	1
6	F	8	12	4
7	G	13	11	-2
8	H	0	8	8
9	I	16	13	-3
10	J	17	19	2
11	K	0	11	11
12	L	12	15	3
13	M	12	14	2
14	N	11	16	5
15	O	13	16	3
16	P	22	25	3
17	Q	0	7	7
18	R	21	23	2
19	S	8	16	8
20	T	18	16	-2

APPENDIX - II**CLASS 10 A3, COMPARISON OF THE TWO TEST SCORES IN THE SAMPLE OF 20 STUDENTS**

S. No.	Name	TEST1 (PRE-TEST) 25 marks	TEST2 (POST -TEST) 25 marks	DIFFERENCE
1	A	7	15	8
2	B	11	16	5
3	C	18	23	5
4	D	2	15	13
5	E	9	21	12
6	F	15	14	-1
7	G	8	11	3
8	H	11	16	5
9	I	14	17	3
10	J	5	19	14
11	K	6	11	5
12	L	12	15	3
13	M	11	14	3
14	N	19	17	-2
15	O	2	10	8
16	P	0	11	11
17	Q	14	15	1
18	R	7	20	13
19	S	8	14	6
20	T	14	16	2

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