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The Role of Mother tongue on the Development of English Early Literacy Skills among Pre-Primary Children in Gasabo District, Rwanda

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Abstract

The study aimed to investigate the role of Kinyarwanda as mother tongue on the development of English early literacy skills among pre-primary children in Gasabo district. The study used a descriptive research design where a census approach ensured that there is no sampling error since data was collected from the entire population. The population consisted of pre-primary children in Gasabo district. A total of 99 children were selected from 3 sampled schools, including Umuco Mwiza School, GS Kimironko and GS Gicaca 1. The schools were from Kimironko and Gikomero sectors. The two sectors were selected purposively to represent other sectors in Gasabo sector. Therefore, with the inclusion criteria of schools with teachers certified to teach in nurseries, we remained with only those 3 schools (2 schools from Kimironko sector and 1 school from Gikomero sector). The researcher used a questionnaire to collect data. Thus, a critical review was conducted to aid in identifying the appropriateness of the instrument to be used in this study. The questionnaire had three sections: Learners' Pronunciation Fluency, Learners' Grammar Proficiency and Learners' Literacy Performance. Each of the research question's data was analyzed using frequencies and percentages. In this case, the study used a test score to measure how well the pre-primary children answered the given test in each of the sections of the questionnaire in relation to English early literacy skills. The section of the questionnaire on grammar proficiency was marked out of 20 marks and the rest of the sections were marked out of 15 marks each. The scores had an interval of 5. Based on the findings of the study, the researcher concluded that Kinyarwanda as mother tongue plays a very positive role on the development of English pronunciation fluency among pre-primary children. The actual implementation of the English language policy in pre-primary helped the learners improve their pronunciation of English sounds based on their home background use of Kinyarwanda as mother tongue. The researcher further concluded that Kinyarwanda as mother tongue had a negative role on the development of English early literacy skills in terms of grammar proficiency because there is still direct transfer of rules from Kinyarwanda to English which leads to wrong English grammar proficiency. Lastly, Kinyarwanda's role as mother tongue led to relatively low performance in English literacy performance. A bigger percentage of learners that did the test got less marks compared to the overall

number of learners that sat for the test. In relation to the study findings, the study recommends the following: In reinforcing the positive role of Kinyarwanda as mother tongue on the development of English pronunciation fluency among pre-primary children, the use of Kinyarwanda in children's homes should be emphasized and incorporated into early education. This will shape young children's English pronunciation fluency. On the role of Kinyarwanda as mother tongue on the development of English grammar proficiency of pre-primary children, the negative role of direct transfer of rules from Kinyarwanda to English which leads to wrong English grammar proficiency should be corrected by educators prioritizing the introduction and teaching of irregular English forms, such as verb forms, prepositions, and plurals, at an early stage. Utilizing appropriate teaching methods like phonics and whole word approaches can help learners identify differences between Kinyarwanda and English. Lastly, on the role of Kinyarwanda as mother tongue on the development of English literacy performance of pre-primary children, the Ministry of Education should raise awareness among parents and guardians about the importance of providing sufficient reading materials and references in Kinyarwanda. This will help young children to establish a strong local language foundation, hence improving their English literacy performance at an early stage. Additionally, efforts should be made to document the orthographies of local languages in various districts and establish resources like reference materials and reading texts in Kinyarwanda.

***Keywords*— Kinyarwanda mother tongue, English early literacy, pronunciation fluency, grammar proficiency, pre-primary education.**

I. INTRODUCTION

Language is one of natural factors that help the growth of education systems (Dodiya, 2018). Language is not only used in the education system of any given country, but it also serves other purposes including interaction as a way of expressing feelings and ideas. When a specific group speaks or uses its language, then that language is termed as the mother tongue (local language). However, Rwanda being a country with only one group of people (one culture), it has only one spoken local language, Kinyarwanda.

The reinforcement of English as the language of instruction in Rwandan schools begins as early as at the nursery level. Haman et al., (2017) indicates that the period spanning from birth to approximately age 10 constitutes the optimal window for introducing new languages to young children. This critical developmental stage is marked with heightened neuroplasticity and language acquisition abilities, making it an opportune time to lay the foundation for multilingual proficiency. By integrating English instruction from the earliest stages of education, Rwandan schools not only enable linguistic diversity, but it also capitalizes on the cognitive advantages associated with early language exposure. Therefore, emphasizing English language instruction from nursery level onwards aligns with both educational best practices and the developmental needs of young learners, fostering a solid linguistic framework for learners' future academic and professional endeavors (Ghasemi & Hashemi, 2011).

Once children can easily speak in their own mother tongue, this can help them learn a second language much easier (Rivera et al., 2023). They use the same skills acquired to learn the second language. In Rwanda, English is one of official languages and a language of instruction from nursery to postgraduate levels. The language is gaining popularity because of the benefits it offers internationally. English is used as a vehicle for science, research, mass media, international entertainment and literature. By the end of nursery education, children are expected to have mastered basic literacies in English. Therefore, literacy in English continue to be the most important determinant of children's future success in schools and at work (Faulkner-bond et al., 2012).

When children are offered opportunities to learn English in pre-primary schools, they are more likely to succeed in primary level of education (Raghuvanshi, 2020). UNESCO (2006) suggests that the transition to a language of instruction other than the child's L1 should not be required of learners before age 6 to 8 years. In addition, other reports on mother tongue-based programs concluded that children who learn in L1, age six to eight years of formal schooling have better academic performance and self-esteem than those who receive instruction exclusively in the official language or those who transition too early from the home language to the official language.

In relation to the above, (Save the Children, 2015) indicated that Rwanda has one of the highest primary school enrolment rates in Africa (97.6%) and yet ensuring that all students learn to read in the early grades remains a challenge because they lack basic early literacy skills, they should have acquired at their pre-

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primary school level. In Save the Children's early literacy assessment carried out, it was found that half of primary grade one (P.1) learners were unable to read a single word of grade-level text. One reason for this alarming finding was that children did not enter P.1 (grade 1) with the necessary school readiness and English emergent reading skills from pre-primary.

The assessment carried out indicated that 99% of the P.1 children were not able to fluently (with accuracy) read any word in the short English story that was given. This was a manifestation of lack of early literacy skill. Kagabo (2008) explained that in Rwanda, there has been limited research on the role of mother tongue on the development of English Early Literacy Skills among pre-primary children. This gap needs to be addressed.

II. LITERATURE REVIEW

Literature review on the impact of mother tongues on the development of English literacy skills among pre-primary children delves into the significance of linguistic foundations in early childhood education. This review explores existing research and theoretical frameworks surrounding the role of mother tongues, particularly Kinyarwanda, and its influence on the acquisition and proficiency of English language skills. The review provides a comprehensive understanding of the intricate interplay between mother tongues and early literacy skills in English.

Transition from Kinyarwanda to English

Rwanda Ministry of Education (2019) directed that all primary schools should use English as a language of instruction from primary one to primary six. This was a shift from the use of Kinyarwanda as a language of instruction from primary one to primary three. Kinyarwanda remained a subject to be taught from lower to upper primary. The ministry restated the Rwanda's vision to enhance proficiency of all languages, focusing attention on using English as a language of instruction. In Rwanda, the transition from Kinyarwanda to English carries cognitive implications, punctuated by a complex web of controversies. In relation to the above, young children exposed to bilingual environments exhibit enhanced neutral activity, particularly in brain regions associated with memory, attention, and language.

A neutral activity refers to an action, task or behavior that does not inherently carry a positive or negative connotation. It is devoid of bias, prejudice or favoritism toward any particular outcome, opinion or belief. In other words, a neutral activity is one that does not lean towards any specific perspective, ideology or stance, but rather maintains an objective and impartial stance. This phenomenon underscores the potential for cognitive enrichment when embracing linguistic diversity in early education. However, it is imperative to acknowledge the contrasting perspective articulated by Xu (2023) that introducing multiple languages at an early age could potentially confuse young minds, leading to development delays. This juxtaposition of cognitive advantages and concerns surrounding the medium of instruction highlights the intricate nature of language acquisition in early childhood education warranting a comprehensive exploration of its multifaceted effects (Cantoni, 2007).

Kinyarwanda as Mother Tongue and English Pronunciation Fluency

Pronunciation is the way in which words are spoken or articulated, encompassing specific sounds, stress patterns, intonation and rhythm used by speakers to convey meaning in a language. It is the correct way of pronouncing a word sound in each language (Chambers 2Ist century dictionary). Pronunciation of words differs from language to language. For example, Kinyarwanda and some other African languages have five distinct vowel sounds while some languages from the Democratic Republic of Congo (DRC) have seven, but English has more. Therefore, these differences in languages make the learning of English as second language a complex puzzle as learners may be tempted to transfer rules of the first language to the second language, leading to pronunciations like /puk/ instead of /buk/(Aziz et al., 2019).

Wach (2011) argues that deviations in performance of foreign language by speaker from native-speaker-like norms of pronunciation are due to the influence of differences between the phonetic patterns of foreign language and the speaker's own native language. Furthermore, findings in the field of sociolinguistics show that social groups may differ not simply in terms of their phonetic systems or which pronunciation they use but in how often they use certain pronunciations (Eckert & Labov, 2017). Eckert and Labov's argument seems to disagree with MINEDUC's assertion that the learner who learns in their local language first, learns English faster (Niyibizi, 2015).

Kinyarwanda as Mother Tongue and English Grammar Proficiency

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The Oxford Advanced Learners Dictionary defines grammar as the study or science of rules for combination of words. Grammar may be roughly defined as the way a language manipulates and combines words (or bits of words) in order to form longer units of meaning (Sioco & De Vera, 2018). Furthermore, Mukrimaa et al. (2016) defines grammar as a system of rules which determines how words are put together to form grammatically well-formed phrases, how the phrases are put together to form grammatically well-formed clauses and how the clauses are put together to form grammatically well formed) sentences. Therefore, according to these definitions, ill formed combinations of words, phrases and clauses, combinations that break the rules of grammar, are ungrammatical. Grammar determines which form of a word is used in speech and in writing (Nurhayati, 2019).

Zaabalawi (2021) explains that teaching grammar through translation has long been a contentious issue. This translation hinders the L2 learning process in as much as it promotes language transfer. Therefore, this creates in the mind of the L2 learners the wrong belief that structural and lexical items correspond to different languages.

Kinyarwanda Mother Tongue and English Literacy Performance

The Oxford Advanced Learners Dictionary defines literacy as 'the ability to read and write. Once children are literate in their own local language, they can learn a second language much easier because they can use the reading skills they acquired as a tool to learn the second language (Acosta, 2019). Additionally, MINEDUC (2008) affirms that children who spend their first years at school learning in their own language will be much better prepared for a second language.

It is important to clarify that both L1 and L2 acquisition by young children (up to around age 7) appear to differ significantly from language acquisition by older children (Rivera et al., 2023). Therefore, the distinctive nature of young children's L2 acquisition calls for a distinctive approach to supporting L2 acquisition in the early years. According to Rivera et al. (2023), the pace of learning an additional language and ability of children to learn an additional language depend upon whether the child has developed literacy in L1 or not. In other words, literacy entails the development of metalinguistic awareness, including the knowledge that the pronunciation of words is related to the written form (for most languages) and that there are 'right' and 'wrong' ways to say things (Rintaningrum, 2009).

Literature indicates that the development of literacy skills in L1 leads to better academic outcomes in L2, hence better outcomes in second language learning (Clark, 2022). Clark argues strongly that children should not be required to transition to instruction in L2 until they have achieved academic fluency and are fully literate in L1.

Indeed, fluency and literacy in the mother tongue lay a cognitive and linguistic foundation for learning additional languages. Therefore, if young children continue to have opportunities to develop their first language skills in lower classes, they emerge as bilingual (or multilingual) learners. If, however, children are forced to switch abruptly or transition too soon from learning in their mother tongue to schooling in a second language, their first language acquisition may be attenuated or even lost (Kagwesage, 2013).

More importantly, their self-confidence as learners and their interest in what they are learning may decline, leading to lack of motivation, school failure, and early school leaving (Woźniak et al., 2022).

Unlike the English language, Kinyarwanda language reading and writing is regular, that is, consonant followed by a vowel. On the other hand, English has more sounds than Kinyarwanda and this poses difficulty to Banyarwanda learners of English. Therefore, the acquisition of a second language in early childhood broadens the child's mind and enriches it more than it harms it.

Thus, children are not only able to speak languages despite being very young but also acquire knowledge about the different cultures and environments (Guzman & Vera, 2018).

Parents desire their children to learn English as early as possible, and some who are well off financially transfer their children to private nursery schools that communicate in English. This is aimed at enhancing their children's English skills from very beginning. Therefore, this thinking can find justification in the immersion theory (Wach, 2011). Thus, this study aimed at assessing the role of Kinyarwanda as mother tongue on the development of English Early Literacy Skills among Pre-Primary Children.

III. METHODOLOGY

Research Design

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The study used descriptive statistics because of its many uses (Creswell, 2015). Descriptive research design is a powerful tool used by scientists and researchers to gather information about a particular group or phenomenon. This type of research provided a detailed and accurate picture of characteristics and behaviors of pre-primary schools in Gasabo District, City of Kigali.

Population and Sampling

Gasabo District report (2018) affirms that the total number of pre-primary schools in the district is 113 (children in the ages 3-6). The highest number of schools is in Kimironko Sector (20 schools) and the lowest number of schools is in Gikomero Sector (3 schools). Due to this big difference of school population in the district, Kimironko and Gikomero sectors were selected purposively to represent other sectors. With the inclusion criteria of schools with teachers certified to teach in nurseries, the study remained with 3 schools (2 schools from Kimironko sector and 1 school from Gikomero sector). The total population from the 3 schools was 99 children, using the census method. The census method is typically used in research when the goal is to gather data from every member of the population being studied, rather than just a sample. This method is employed when the population size is relatively small or manageable, or when resources permit the collection of data from every individual. The census approach ensures that there is no sampling error since data is collected from the entire population.

Research Instruments

The researcher used a questionnaire to collect data. Thus, a critical review was conducted to aid in identifying the appropriateness of the instrument to be used in this study. The questionnaire had three sections: Learners' Pronunciation Fluency, Learners' Grammar Proficiency and Learners' Literacy Performance.

Validity and Reliability

The researcher ensured content validity with the help of experts who read through the responses from the administered questionnaire to make sure that those responses were answering the questions asked. What was found not to be adequately giving the required information as per the research questions, was modified or left out and replaced by accurate ones.

Statistical treatment of Data

Each of the research question's data was analyzed using frequencies and percentages. In this case, the study used a test score to measure how well the pre-primary children answered the given test in each of the sections of the questionnaire (Learners' Pronunciation Fluency, Learners' Grammar Proficiency and Learners' Literacy Performance) in relation to English early literacy skills. The three sections of the questionnaire were marked out of 15 marks, 20 marks and 15 marks respectively. The scores had an interval of 5.

Ethical considerations

The researcher ensured that ethics were highly observed before and during the process of this research. The participants were assured that their responses would be strictly used with high confidentiality and be used only for the purposes of the study. Informed consent was an on-going feature of the research process, with scheduled review points built into the study and the right to withdraw was constantly respected.

IV. FINDINGS AND DISCUSSION

This study presents the findings of the study. The section is guided by research questions as follows:

Research Question 1: What is the role of Kinyarwanda as mother tongue in the development of English pronunciation fluency of pre-primary school children in the Gasabo District?

To answer this research question, the researchers administered a test to respondents to establish their English language pronunciation fluency. In this case, the respondents were supposed to tick the correct sounds and correct words based on the researchers' (English specialist) pronunciation of the specific sounds and words that were listed. This meant that children were supposed to be attentive and listen to sounds and words pronounced. Answers from the children were supposed to rhyme with what was on the marking guide. The whole section on pronunciation fluency consisted of 15 items and the class interval of the scores was 5.

Table 1 presents the findings from the three schools on the role of Kinyarwanda as mother tongue on the development of English pronunciation fluency.

The findings showed that 7 students (3 students from Umuco Mwiza School, 2 students from GS Kimironko and 2 students from GS Gicaca 1 scored in the range of 1 to 5 which is 7%. In the range of 6 to 10, 14 students (5 students from Umuco Mwiza School, none from Gs Kimironko and 9 students from GS Gicaca 1 had 14%. Moreover, 78 students (36 students from Umuco Mwiza School, 25 students from Gs Kimironko and 17 students from Gs Gicaca 1) got scores in the range of 11 to 15 equal to 79%. The questionnaire was marked out of 15 marks. The scores in the range of 11-15 reveal a very

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good rate of pronunciation fluency compared to 7% and 14% of students who scored below the range of 11-15. Therefore, this performance signifies the role of Kinyarwanda as mother tongue on the development of English pronunciation fluency of pre-primary school children. The performance showed how the learners could pronounce specific sounds and words that were listed due to linguistic transfer.

Table 1: Learners' Pronunciation Fluency.

Umuco Mwiza School	GS Kimironko	GS Gicaca1			
Class interval	**Frequency**	**Frequency**	**Frequency**	**Total Frequency**	**Percentage**
1-5	3	2	2	7	7
6-10	5	0	9	14	14
11-15	36	25	17	78	79
TOTAL	**44**	**27**	**28**	**99**	**100**

Research Question 2: What is the role of Kinyarwanda as mother tongue on the development of English grammar proficiency of pre-primary children in the Gasabo District?

To answer this research question, the researchers administered a test to respondents to test their English grammar proficiency. In this section, a set of structural exercises and completion tasks in English were given to respondents in the three schools. The whole section on grammar proficiency consisted of 20 items and the class interval of the scores was 5.

Table 2: Learners' Grammar Proficiency.

Umuco Mwiza School	GS Kimironko	GS Gicaca1			
Class interval	**Frequency**	**Frequency**	**Frequency**	**Total Frequency**	**Percentage**
1-5	5	1	4	10	10
6-10	23	13	16	52	53
11-15	15	13	8	36	36
16-20	1	0	0	1	1
TOTAL	**44**	**27**	**28**	**99**	**100**

Table 2 presents the findings from the three schools on the role of Kinyarwanda as mother tongue on the development of English grammar proficiency. The table show that 10 students (5 students from Umuco Mwiza School, 1 student from GS Kimironko and 4 students from GS Gicaca 1) scored in the range of 1 to 5 which is 10%. In the range of 6 to 10, 52 students (23 students from Umuco Mwiza school, 13 students from Gs Kimironko and 16 students from GS Gicaca 1) scored 53%. In addition, 36 students (15 students from Umuco Mwiza School, 13 students from GS Kimironko and 8 students from GS Gicaca 1) got scores in the range of 11 to 15 which is 36%. In the score range of 16 to 20, only 1 student from Umuco Mwiza School scored 1%. Therefore, the results showed a very low performance rate of grammar proficiency since students who scored between 11 to 15 and 16 to 20 had only 36% and 1% respectively.

Research Question 3: Describe the role of Kinyarwanda as mother tongue on the development of English literacy performance of pre-primary children in Gasabo District.

This research question was answered using picture composition in the three schools to elicit learners' competence in English language reading and writing. The whole section on learners' literacy performance consisted of 15 items and the class interval of the scores was 5.

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Table 3: Learners' Literacy Performance.

Umuco Mwiza School	GS Kimironko	GS Gicaca1			
Class interval	**Frequency**	**Frequency**	**Frequency**	**Total Frequency**	**Percentage**
1-5	3	12	7	22	22.2
6-10	16	0	13	29	29.3
11-15	25	15	8	48	48.5
TOTAL	**44**	**27**	**28**	**99**	**100**

Table 3 gives the findings from the three schools on the role of Kinyarwanda as mother tongue on the development of English literacy performance. The findings show that 22 students (3 students from Umuco Mwiza School, 12 students from GS Kimironko and 7 students from GS Gicaca 1) scored in the range of 1 to 5 which is 22.2%. In the range of 6 to 10, 29 students (16 students from Umuco Mwiza School, none from GS Kimironko and 13 students from GS Gicaca 1) got 29.3%. Additionally, 48 students (25 students from Umuco Mwiza School, 15 students from GS Kimironko and 8 students from GS Gicaca 1) in the range of 11 to 15 achieved 48.5%. This shows that in the literacy performance aspect, the performance was not good since majority of the students' scores were under the range score of 11 to 15.

V. CONCLUSIONS

The findings on the role of Kinyarwanda as mother tongue in the development of English pronunciation fluency of pre-primary school children in Gasabo district revealed that Kinyarwanda as mother tongue plays a very positive role on the development of English pronunciation fluency among pre-primary children. The findings showed that a substantial majority of students achieved scores indicative of good pronunciation skills, reflecting the positive influence of linguistic transfer from Kinyarwanda to English. This shows that the use of Kinyarwanda as a mother tongue in children's homes and incorporating it into early education can shape young children's English pronunciation fluency. Furthermore, the results on the role of Kinyarwanda as mother tongue on the development of English grammar proficiency of pre-primary children in the Gasabo district showed that the use of Kinyarwanda as mother tongue had a negative role on the development of English early literacy skills in terms of grammar proficiency because there is still direct transfer of rules from Kinyarwanda to English which leads to wrong English grammar proficiency. Lastly, in finding out the role of Kinyarwanda as mother tongue on the development of English literacy performance of pre-primary children in Gasabo district, the findings revealed that to a larger extent Kinyarwanda as mother tongue impacts negatively on the development of English literacy performance of pre-primary children in Gasabo district. Kinyarwanda impacted the development of English literacy performance to a smaller extent.

VI. RECOMMENDATIONS

In reinforcing the positive role of Kinyarwanda as mother tongue on the development of English pronunciation fluency among pre-primary children, the use of Kinyarwanda in children's homes should be emphasized and incorporated into early education. This will shape young children's English pronunciation fluency. On the role of Kinyarwanda as mother tongue on the development of English grammar proficiency of pre-primary children, the negative role of direct transfer of rules from Kinyarwanda to English which leads to wrong English grammar proficiency should be corrected by educators prioritizing the introduction and teaching of irregular English forms, such as verb forms, prepositions, and plurals, at an early stage. Utilizing appropriate teaching methods like phonics and whole word approaches can help learners identify differences between Kinyarwanda and English. Lastly, on the role of Kinyarwanda as mother tongue on the development of English literacy performance of pre-primary children,

the Ministry of Education should raise awareness among parents and guardians about the importance of providing sufficient reading materials and references in Kinyarwanda. This will help young children to establish a strong local language foundation, hence improving their English literacy performance at an early stage. Additionally, efforts should be made to document the orthographies of local languages in various districts and establish resources like reference materials and reading texts in Kinyarwanda.

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The Flipped classroom technique to improve students' understanding of concepts in Physical Chemistry coursework

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Abstract

Physical chemistry (PChem) students often have negative perceptions and low expectations for success in PChem, attitudes that likely affect their performance. Students mostly struggle in understanding the fundamental theoretical concepts and their application in solving complex numerical problems in PChem during their first year in undergraduate programme. To help students in learning to solve the problems related to PChem course, flipped classroom modules was implemented for small number of PChem students (CEB1023/CDB1023). The flipped classroom is a pedagogical approach that moves course content from the classroom to homework, and uses class time for engaging activities and instructor-guided problem solving. It is a strategy in which students must undergo self-study prior to the actual classroom. Learning materials such as video, notes and postcards would be given to students prior to the commencement of the class. While, during the class more collaborative activities to engage student learning such as group activities and face-to-face (F2F) engagement with lecturer. The main motive of this study is to increase students' motivation and understanding of PChem course by implementing the computer technology (particularly internet applications multimedia properties) during their teaching and learning process. Besides assessing the students' deeper understanding, the findings from this study will be utilized to assess the impact of flipped classroom as well as the effectiveness of the computer technology on students' exam performance and motivation. Also, the findings may enhance lecturers' understanding on how to apply the flipped classroom model in ways that are most beneficial both for students and lecturers. By combining collaborative activities and F2F approach (during the class), it would enhance students' learning and finally becomes independent learners which is one of the main attributes of UTP graduates.

***Keywords*— Physical chemistry, Flipped learning, engineering, learning outcomes, course portfolio.**

I. INTRODUCTION

Physical Chemistry (PChem) is one of the required main courses in Chemical Engineering programme. It is important for Chemical engineering students to pass and to understand the contents of PChem course as this course is a pre-requisite of chemical engineering thermodynamics, Reaction engineering and separation process for Chemical Engineering Program in UTP. Based on the feedback from the students taking Chemical Engineering, the students attributed difficulties associated with the course to superficial conceptual understanding and its application in solving complex numerical problem and plus having no motivation or interest in the topic. From lecturer observation and literature, for example, students had difficulties with conceptual understanding of ideal gas law concept and how to drive the ideal gas equation

and further limited understanding on application of ideal gas equation in complex problems in PChem [1-4]. This problem basically comes from limited understanding of what basic rules of Calculus, Algebra and Psychometric issues such as reliable assessments and addressing correlations with other factors Students with conceptual understanding know more than isolated facts and methods.

PChem students often have negative perceptions and low expectations for success in this course. Students mostly struggle in understanding the fundamental theoretical concepts and their application in solving complex numerical problems in PChem during their first year. To help students in learning to solve the problems related to this course, flipped classroom modules was implemented for 184 students (CEB1023/CDB1023). The flipped classroom is a pedagogical approach that moves course content from the classroom to homework and uses class time for engaging activities and instructor-guided problem solving [5-7]. It is a strategy in which students must undergo self-study prior to the actual classroom. Learning materials such as video, notes and postcards would be given to students prior to the commencement of the class. While, during the class more collaborative activities to engage student learning such as group activities and face-to-face (F2F) engagement with lecturer. The main motive of this study is to increase students' motivation and understanding in PChem course by implementing the computer technology (particularly internet applications multimedia properties) during their teaching and learning process. Besides assessing the students' deeper understanding, the findings from this study will be utilized to assess the impact of flipped classroom as well as the effectiveness of the computer technology on students' exam performance and motivation. Also, the findings may enhance lecturers' understanding on how to apply the flipped classroom model in ways that are most beneficial both for students and lecturers. By combining collaborative activities and face to face approach (in class), it would enhance students' learning and finally becomes independent learners which is one of the main attributes of UTP graduates. In recent years, flipped based active learning strategy, also known as inverted instruction, has attracted growing attention from both teaching and research groups as the promising learning and reaching techniques. A flipped classroom can be defined as a class content which is traditionally delivered by a teacher/lecturer, will be replaced with activities and the content would be given prior to the commencement of the class in form of notes, video, slides, computer technology, etc. Due to recent improvements in Information communication technology (ICT) tools, web pages, interactive video properties and recorded videos are generally preferred to introduce content outside the classroom. The flipped classroom also is one of the techniques in the area of instructional innovation that lead to the increased use of active learning in science, technology, engineering, and mathematics (STEM) disciplines [3, 4, 5, 6]. Over the years, researchers have proposed several benefits of flipped classroom/instruction such as an increased of students' satisfaction, improvement of students' lecture attendance and improvement of students' academic performance (as measured by improved examination results and/or overall grades) [6-8]. Qualitative feedback obtained from student evaluations also suggested they have improved opportunities for developing communication skills, preferences for working in teams and increased teacher encouragement and learning as compared to the traditional method [9-10].

Based on the discussion above, flipped classroom can be defined as having three features: (i) mandatory pre-class learning of new material followed by (ii) in-depth explanation, practice, and productive use of knowledge in class through active learning techniques, where (iii) class attendance is mandatory [11-15] as shown in Figure 1 and that of non flipped classroom method in Figure 2. All these three features are necessary in this study.

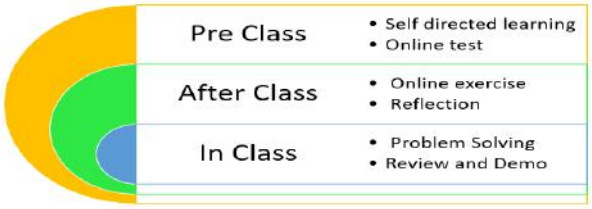

Fig.1: Flipped classroom method.

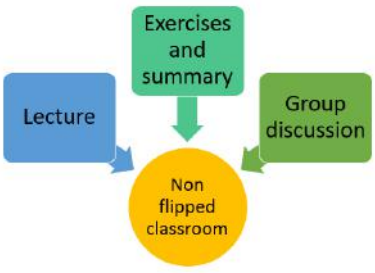

Fig.2: Non flipped classroom strategy

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Physical Chemistry course is one of the core disciplinal in Chemical Engineering offered by Department of Chemical Engineering at Universiti Teknologi PETRONAS (UTP). A typical class of this course at UTP consists of approximately 150-200 students. Based on the experience of the lecturers teaching this course, most students faced some misconceptions and difficulties in the area of conceptual understanding and formula application; and thus they lacked ability to solve complex numerical problem especially at higher order level of knowledge (K4 apply, K5 evaluate and K6 create). Students found that mathematical derivations and their formula applications are the toughest area in in this course.

II. TEACHING-LEARNING METHODOLOGY

In this study, action-research methods were conducted. The activity proposed was conducted in in one semester of September 2023 with the implementation of flipped module and further compared with the coursework of May 2022 without implementing flipped module at Universiti Teknologi Petronas.

The study focuses on the effectiveness of information communication tools (ICT) and techniques used in the flipped classroom that would improve students' conceptual understanding on PChem while working on basic derivations and their application in complex numerical problems. This study involves:

- ✓ Identify and design
- ✓ Teaching and learning approach
- ✓ Assessment/Evaluation on the activities

The methodology is comprised of three stages: (1) Pre-class, (2) In-class and (3) Post-class. Details of each stage is elucidated as follows:

(1) Pre-class

The students are provided with relevant learning materials such as video lectures, notes power point presentation, assigned readings and selected appropriate video lectures relevant to the topics and they are expected to study/view the lecture materials prior attending the lecture class. After reviewing the lecture materials, students are introduced to in-class quizzes or on-line quizzes. Evaluation was made based on the answers of in-class quizzes or on-line quizzes by means of well-structured rubrics.

(2) In-class

In the flipped classroom, the time distribution was used to oversee the collaborative activities as follows.

(i) Group activities – Students are divided into small groups each comprising of 5-6 students with one of the students from each group representing as leader. Each member in the groups is advised to actively discuss about the content provided in a pre-class mode. Students was assigned problems of pre-class mode to discuss and solve the problems in group. These activities and discussions was facilitated by the lecturer. These activities was recorded so that the students can do the revision outside the class from the recorded activities, particularly the recorded activities of question and answer sessions with the lecturer.

(ii) Face-to-face (F2F) activities – In order to discuss mathematical derivation and solve the complex numerical problems of pre-class mode, group was selected randomly to avoid the delay due to restricted mobility in the classroom. Each member of the group was asked to report answers by writing them on the white board as well as explaining the answers verbally to the class using correct terminology. The lecturer was facilitate the problem-solving sessions and at the same time to clarify any misunderstood concepts, derivation or numerical to further strengthen the students' understanding on thermodynamics, phase behavior and chemical kinetics, catalysis and electrochemical system. A video recording was conducted for each group discussion. Peer evaluation was made for each of the groups based on the rubrics.

(iii) Attendance – Students earn participation points by coming to class on time and actively participating in discussions during the problem-solving activities for the day.

(3) Post-class

In this stage, the students was given the questionnaire survey in order to obtain the feedback from the students on their understanding concepts/ derivation/ formula application, a survey to analyze or quantity the learning outcomes during the flipped classroom activities. The survey was use on-line tools such as goggle forms (may change this tool based on the current need of students). The interview session was conducted after the group discussion (in-class) as a form of feedback from students.

Both the students and lecturer was also require to list their reflections on the activity in order to determine whether the teaching and learning materials, and the

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activities conducted helped the students' in understanding the concepts/ derivation/ formula application. The perception of the students was analyzed qualitatively and quantitatively based on the percentage attainment and further the changes for improvement shall be proposed to be implemented by using a different approach based on the feedback.

In order to study the academic performance, the results of coursework for September 2023 semester for the PChem course was analyzed and compared to batches that experienced non-flipped course, i.e. batches of May 2022 to analyze the percentage impact and further are compared with January 2022 students without implementing flipped module.

III. RESULTS AND DISCUSSION

From Figure 3 it is evident that students outperformed by implementing flipped module compared to earlier semester. By using flipped learning students advanced better by 48.27 % in securing an A grade compared without applying flipped module. However, by applying flipped module students have presented better between A – C+ grades in in-class activities. The results show that there has been an increase in percentage by 62.96%, 8.6% and 60.49% in achieving A-, B+ and C grades compared with January 2022 semester based on coursework. Similarly, Figure 4 shows that when compared for final exam students outperformed in September 2023 with an increase in percentage of 40.42%, 32.87%, 10%. 38.21% respectively from A-B grades compared to May 2022 final exam without implementing flipped module.

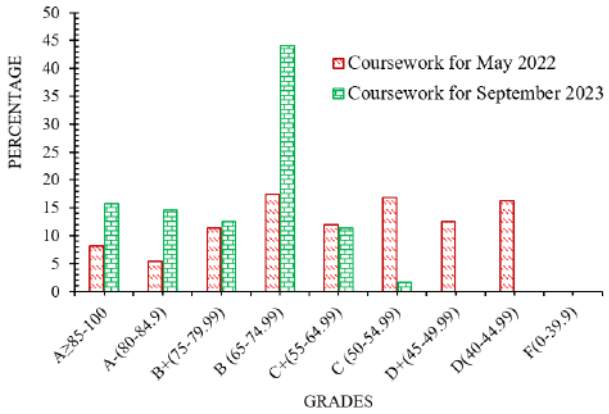

Fig.3: Percentage attainment with and without flipped learning for coursework.

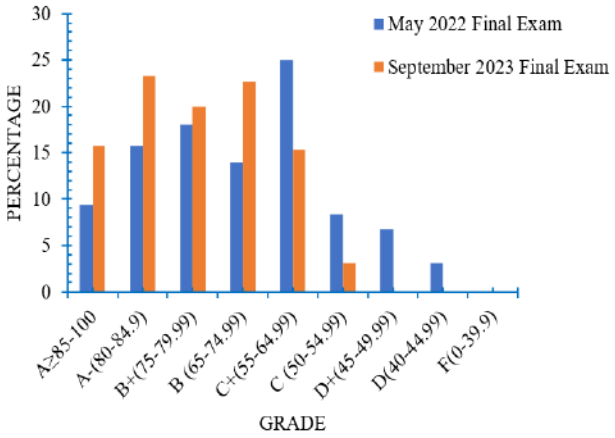

Fig.4: Percentage success for final exam with and without flipped learning.

Above Figures 3&4 shows that flipped module has altered the students to execute better by dynamically being active in groups, and as well as individually to improve their overall advancement of skills. The cause of students failure without implementing the flipped classroom might be as students have no enthusiasm to perform their work and do not take it seriously while responding to test/quiz because they know that teachers will not give them a zero. This inception makes them be unserious. The practice of flip module in solving complicated problems has enriched student's core expertise and cognitive expertise. Furthermore, students acquired involvement skills and appreciated online learning meetings. Students knew to work among their peers. This approach helps teachers to provide a more modified tactic to specific students. Overall, it has great potential in promoting students' critical creative thinking capabilities and transmuting passive learners into active learners. The suggested future research approach will be of interest to educators, academics, and researchers.

IV. CONCLUSION

This research focuses on the importance of flip learning in improving engineering education, especially for first-year engineering students in PChem coursework. Student feedback shows a positive learning experience, which indicates that flip learning increase understanding in students about the application of their theoretical knowledge to industrial application related to physical chemistry. This approach not only enhances practical learning but also helps in developing problem-solving,

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decision-making skills for students for future professional challenges.

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Digital Technology in English Language Learning: Opportunities, Challenges, and Innovations in India's Education Landscape

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Abstract

Against the background of India's multicultural society, this paper elucidates the progressive use of digital advancement in learning the English language. This research paper focuses on the opportunities for digital technologies in English learning in India and its progress and further growth. It reveals several technological possibilities encompassing the use of additional multimedia tools in learning, the generation/development of mobile applications for learners in urban and rural areas, their ability to choose according to their needs, and the provision of easy access to learning. The paper also highlights specific concerns in the Indian context of studying, namely the urgent need to address the digital access divide, lack of physical facilities, and socio-economic factors that limit people's ability to apply technology for learning. This paper further outlines the emergence of transformative trends that are reshaping the landscape of English language education in India. These trends include the integration of Augmented Reality/Virtual Reality in language learning and teaching. The study provides a comprehensive understanding of the digital technologies that are revolutionising the acquisition of English in India, drawing on a systematic analysis of existing literature. The research findings underscore the critical challenges and issues that must be addressed to fully leverage the potential of digital transformation in enhancing English learning nationwide.

Keywords— Digital age, English Language, India, Learning, Technology.

I. INTRODUCTION

The integration of digital technologies has dramatically impacted education, especially in the learning of the English language. Since teaching of English encounters challenges that arise from the linguistic diversity in a multicultural country such as India, the integration of digital tools offers a plethora of new options that can be adopted to enhance the teaching and learning of the language. As learners from various socio-economic backgrounds seek access to quality education, technology has emerged as a powerful tool to bridge gaps, making learning more accessible and engaging. Cheng et al. (2015) opined that ELT has witnessed several changes with the emergence of technological advancements that altered traditional teaching methodologies. These changes are especially significant in cases where there is a growing use of multimedia tools, mobile applications, and online learning platforms to identify learning needs and preferences. Likewise, Jamalova (2023) supports this by asserting that incorporating technology in teaching and learning environments not only increases the students' interest level but also improves students' competencies in the

four skills, namely reading, writing, listening, and speaking.

"In recent years, the Indian education system has witnessed a push towards digitisation, driven by initiatives such as Digital India (NEP, 2020, p. 5)". These initiatives aim to expand access to digital resources and improve the quality of education, particularly in rural and underserved areas. As highlighted by Motteram (2013), digital innovations such as Computer-Assisted Language Learning (CALL) and Mobile-Assisted Language Learning (MALL) have become integral to English language instruction, offering flexibility and personalised learning experiences that cater to individual learner needs.

However, despite these advancements, challenges remain. The digital divide—stemming from unequal access to technology and the internet—continues hindering equitable educational opportunity distribution. Moreover, socio-economic factors and infrastructural limitations further exacerbate this divide, limiting the potential benefits of digital tools for learners in less privileged areas. Addressing these challenges is crucial for ensuring that digital transformation in English language education is inclusive and impactful.

This study explores the opportunities, challenges, and innovations in using digital technologies for English language learning in India. By thoroughly examining the existing body of literature, this research aims to shed light on the opportunities available and provide insights into the effectiveness of these technologies while also identifying key barriers to their widespread adoption. This study seeks to contribute to the ongoing discourse on how technology can be harnessed to improve English language education in India, particularly in a post-pandemic world where online learning has gained unprecedented prominence. This research also explores novel trends for creating immersive and interactive language education in India by assessing the potential innovative tools such as AR/VR.

II. ELL IN INDIA: A HISTORICAL PERSPECTIVE

2.1 Tracing the Rise of ELL in the Post-Independence Era

Despite being a multilingual powerhouse, colonial India did not welcome English as a language for the masses without resistance. English was considered 'the much-hated language' due to how it unravelled in the Indian subcontinent. Hence, the perceived notions towards English language learning in India suffered a series of dilemmas in the postcolonial period. While there were movements to reduce the influence of English in favour of native languages, English was still widely used and recognised for its practical advantages. It facilitated communication across regions and provided access to global knowledge. Moreover, it remained essential in higher education, business, and governance, with proficiency in English improving employment prospects (Vijayalakshmi & Babu, 1995).

The position of English Language Learning in this context-rich setting has shown positive responses since the post-independence era. According to Ramanujam (2011), "*In a way, an associate official language, English, knowingly or unknowingly has played an instrumental role in maintaining the diversity of India's language scene because the existence of English has meant that it has not been necessary to select any one Indian languages as a national language. In fact, the states which used to rally to slogans such as angriji hatao (remove English) are now eagerly introducing English in the first year of schooling.*" (qtd in Coleman, 2011, p. 28)

Hence, once considered an instrument of oppression, the English language gradually transitioned to a reluctantly adopted lingua franca, catering to the utilitarian purposes of the tech-driven, fast-paced, transformative world.

2.2 The Evolution of Digital Technologies in Education

The evolution of digital technologies in education in India has progressed in three main periods: Pre-pandemic, during-the-pandemic, and post-pandemic eras. The pre-pandemic era saw the dominance of traditional education methods, such as physical classrooms, blackboard teaching, and authoritative-teacher-centered classrooms (Raviya & Upadhyay, 2021). However, the conditions of the classrooms in the pre-pandemic era had several shortcomings, such as low engagement and motivation, monotonous classrooms, etc., that needed to be addressed and acted upon. Furthermore, even though introduced, the digital initiatives lagged when it came to participation. Hota (2022) acknowledged significant challenges in the pre-pandemic era, "including inadequate digital infrastructure and limited access to computers and internet facilities in schools. Only 16.26% of schools had computers, and 7.42% had internet access" (Hota, 2022).

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However, during the pandemic, India saw an exponential rise in integration and active participation in digital technologies, especially in the pandemic and post-pandemic era. Dependence on software applications like learning management systems (LMS), video conferencing, social media platforms, word processors, etc., became inevitable (Alturki & Aldraiweesh, 2021). However, challenges emerged, including disparities in access to devices and internet connectivity (Roy & Brown, 2022). While some institutions successfully implemented integrated LMS approaches, others struggled with fragmented solutions, using separate platforms for video conferencing, student interaction, and content sharing (Roy & Brown, 2022). Despite these challenges, the pandemic accelerated the adoption of digital learning technologies in higher education (Camilleri & Camilleri, 2021; Alturki & Aldraiweesh, 2021). Nonetheless, it is essential to note that India had been planning on going digital before the rise of the Pandemic. The National Knowledge Commission, headed by Sam Pitroda in 2005, crafted a report that extensively focused on digital literacy and the involvement of technology in education systems. The report entitled 'Report to the Nation' published in 2006, suggested key developments in the field of education such as "building an excellent knowledge system to meet the demands of the 21st century, as well as promoting the creation of a knowledge base for technological enhancement" (*Knowledge Commission Report | Government of India, All India Council for Technical Education*, n.d.). The report, however, further reflected on the later initiatives of the government of India. Launching the Digital India Programme on 1 July 2015 became an aegis for digital developments in India. Therefore, the foundation for digital India was already underway when the pandemic occurred. Consequently, this effort gained momentum, resulting in a rapid adoption of distinct technology-driven approaches and frameworks.

The third wave of digital evolution, the post-pandemic era, will play an essential role in shaping India's digital future. The first policy of the 21st century became the cornerstone for its holistic perspective on education with an emphasis on pillars such as equity, accessibility, affordability, etc. NEP (2020) has provided a comprehensive perspective on the 'way forward' on digital education by proposing to establish platforms like the National Education Technology Forum (NETF) with a focus on identifying emerging technologies, capacity building, and sharing the best practices across the educational system to ensure the effective interaction of digital tools (further initiatives by the Nep, 2020 discussed below) (NEP, 2020). However, challenges like infrastructure limitations and lack of scalability persist. Despite these barriers, initiatives like the National Digital Health Mission and Atma Nirbhar Bharat Scheme present opportunities for leveraging technology in the post-pandemic era. The lessons learned from COVID-19 and the accelerated increase in the use of technology are expected to shape India's digital future, implementing innovative and trending technologies, particularly Immersive Digital technologies such as augmented reality and virtual reality, making learning more creative and upgrading the level of education in India.

III. CURRENT TRENDS, SCENARIOS, AND OPPORTUNITIES

3.1 Digital Empowerment in India: Bridging Gaps through Technological Initiatives

Indian education has seen significant transformations in recent years, transitioning from a teacher-focused traditional information delivery system to a student-focused modern digital learning approach. According to Sun (2023), the number of smartphone users in India is estimated to reach 1.55 billion by 2040. To accelerate this process, many state governments have also started distributing smartphones/gadgets to students under programs like UP's 'Swami Vivekananda Youth Empowerment Scheme' to provide smartphones and tablets to schoolchildren, therefore equipping them with the necessary digital competencies and recognising their significance to align with the goal of achieving digital empowerment. The Indian government has also started implementing several digital initiatives to improve accessibility and ensure quality in disseminating education in higher education, especially in response to the COVID-19 Pandemic (Kumar, 2020; Singh et al., 2021). Hota (2022) and Ahmad (2020) listed initiatives such as SWAYAM, DIKSHA, National Digital Library of India (NDL), and PM eVidya, which offer a wide range of online courses across academic disciplines (Hota, 2022; Ahmad, 2020). These platforms assist the learners in retrieving quality education, compensating for the conventional barriers to learning. The government has further started emphasising the use of virtual labs, virtual reality-enabled classrooms, and curated online content for both students and teachers (Arbind Kumar, 2020).

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Collaboration with the private sector, the introduction of language learning digital platforms like 'PlanetSpark' (Based on one of the author's experiences) and the adoption of blended teaching techniques are suggested to enhance digital infrastructure and improve the overall effectiveness of these initiatives (Hota, 2022) and digital platforms like PlanetSpark, etc. In addition, governments are consistently implementing schemes and scholarships such as Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA) and National Scholarship Portal (NSP) to uplift the conditions of marginalised communities and make them digitally literate and bridge the persisting gap between existing classes. However, Hota (2022) insists on the persistent challenges, such as inadequate digital infrastructure, poor internet connectivity in rural areas, and insufficient training on digital methodologies. Therefore, it is crucial to attain a successful equilibrium between technology and conventional ways, which are still a viable strategy but not an impractical alternative to technology. (Uskov et al., 2018)

3.2 Leveraging technology in ELT classrooms

Having ruled out the importance and evolution of English and the emerging use of technology in the field of education in India, it becomes necessary to discern the current situation, trends and methodologies being used in ELT classrooms. Moreover, it is also essential to understand the ground-level implementation and whether or not it is reflected in the learners' performances. Various studies indicate a shift from traditional learning to blended, mobile-assisted, personalised learning (Vaishnav, 2024). Mobile applications in English language learning are highly beneficial for urban and rural learners in India since they cater to their environments. The app's utility is further bolstered by the widespread accessibility of mobile phones and mobile internet, enabling its use in various educational settings ranging from comprehensively equipped schools in major metropolitan regions to schools in rural areas with limited or no amenities. D. Roy and Putatunda (2021) illustrated how the transition to Web 2.0 led to the adoption of various changes to keep up with the changing times. However, they noticed that "the digital divide of the nation led to the asymmetrical distribution of technological and, therefore, educational opportunities to the rural and underprivileged sections of the nation" (Roy & Putatunda, 2021)

Language learning is a complex task and can become tedious at times as it involves not just the pragmatic aspects but a thorough understanding of the rules as well in order to speak correctly. SLA researchers have been actively investigating various methodologies to devise a method that could fulfil the exhaustive needs of the learners. Various methodologies, ranging from the Grammar-Translation Method (GTM) to Communicative Language Teaching (CLT), have been employed and evaluated, leading to the conclusion favouring an eclectic approach. The learning theories, such as Constructivist and task-based theories of language learning, emphasise the creation of knowledge through individuals' interactions with an external socio-cultural environment, positioning language instruction as central to the examination of socio-political discourse (D. Roy & Putatunda, 2021b). However, today's world (with globalisation at its peak) demands a strong emphasis on communicative and intercultural competencies, requiring innovative use of technologies and moving towards innovative methods to meet such requirements (Vaishnav, 2024a). The National Mission on Education through Information and Technology (NMEICT) launched by the Government of India has further reinforced the integration of technology in ELL classrooms with respect to modernising education (*Digital India Initiative of Government Has Revolutionized Education Access in Rural Areas*, n.d.).

Learners actively use Artificial Intelligence and Machine Learning to their full potential. Software like Chat-GPT, Claude, Perplexity, etc., have gained popularity among the young generation and are being used extensively. Furthermore, a school in Kerala - KTCT Higher Secondary School- has recently deployed India's inaugural artificial intelligence (AI) teaching robot, named 'Iris', which was created in partnership with Makerlabs Edutech. Driven by an Intel processor and furnished with an integrated voice assistant, the robot provides tailored educational experiences and engages with pupils through an Android application (Singh, 2024). Introduction of Language Labs, promotion of multi-modal learning, use of interactive software such as Duolingo, Tell Me More, etc., investments in speech recognition software, digital classrooms and learning management systems, making resources available on cloud-based technology, language testing tools, etc. and various others are being actively deployed to enhance the digital potential of India. Therefore, these technological advancements are implemented in an appropriate and just manner might prove to significantly enhance the learning of English.

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IV. ADDRESSING THE CHALLENGES, DIGITAL GAPS AND AI RISKS

India's emphasis on becoming a thriving digital leader and remaining on par with global powers is much appreciated. However, it is also important to address the problems and challenges that remain an integral barrier in the way of its plans. The concerns in the Indian context are not just limited to multilingualism but also include the unequal distribution of assets, such as the case of rural-urban, which leads to a great digital divide. Singh (2010) described the conditions of rural areas as lacking access to ICTs, language labs, and audio-visual aids. Kumar (2024) explores rural India's myriad challenges in learning English. The successful execution of the English Language Teaching (ELT) curriculum at the elementary level encounters significant obstacles in rural environments. According to him, English Language Teaching (ELT) in rural regions stems from "formidable obstacles rooted in psychological, linguistic, institutional, and environmental factors" (Kumar, 2024,p.1). Another study illustrated how "English is often perceived as a subject rather than a language by rural students, hindering their engagement and proficiency" and how the focus is more on "rote memorisation rather than genuine language acquisition" (Ghuge, 2024, p.1). In addition to historical and economic inequalities, these problems are exacerbated by the restricted availability of educational resources and a shortage of skilled English instructors.

Moreover, the lack of favourable learning conditions and insufficient teacher training complicates the provision of effective English language education. A study indicated that the implementation of student-centred learning, adaptation to the new English curriculum, mitigating inadequate teaching resources, and managing overcrowded classrooms constitute substantial hurdles for English educators (Singh, 2010). Another variable underlying ELT classrooms here that poses a challenge is the motivation level of the learners. Due to the varied backgrounds of the learners, the socio-economic biases against the learners lead to rising demotivation.

Moreover, it is also impossible to ignore AI's threats when it comes to learning as a language. A study by Viktorivna et al. (2022) found that the consistent use of AI in Language Learning significantly reduced the learners' spontaneity and creativity levels. Another study listed concerns regarding the use of "AI in ELT could lead to a dehumanisation of language learning, by replacing human interaction and communication with machine and reduction in the quality of language instruction, as students become overly reliant on technology and fail to develop their interpersonal and communication skills" (Rukiati et al., 2023, p.7). Therefore, introducing Artificial Intelligence can be considered a 'blessing in disguise' due to its potential threats that come along with the significant benefits. Therefore, the deployment of AI must be carried out with careful consideration and in an ethical fashion. Hence, assessing the ground-level conditions of the ELT classrooms becomes a critical part of this study, giving us an overview of the challenges that must be tackled.

V. INNOVATIONS – A WAY FORWARD

5.1 Advancing English Language Learning through the emerging AR/VR technologies

As we have already discussed, India's mission is to integrate technology in education through the lens of several key initiatives mentioned above. We look forward to the 'The National Education Policy - 2020'. The NEP (2020) extensively talks about India's goal of digitising education and its future implications, making it a 'Digital epicentre' with a key emphasis on accessibility, equity, and affordability. Moreover, it also implies that the researchers should carry forward their investigations on further implications, ensuring the progress of India's goals. Thus, it becomes necessary to further the discussions on the next-generation digital paradigms, novel trends and innovative methodologies that include the use of Innovative Immersive Digital Teaching (IIDT) such as Virtual Reality (VR) and Augmented Reality (AR). Sinthiya (2023) and Godwin (2023), in their respective works, elicited how AR and VR technologies offer immersive and interactive experiences that can revolutionise English Language Learning (ELL) by providing authentic language exposure and opportunities for real-time communication. AR allows learners to interact with virtual English language content in their immediate surroundings, enhancing comprehension and retention. VR creates fully immersive virtual environments that transport learners to English-speaking settings (Godwin-Jones, 2023).

Furthermore, researchers have also suggested that integrating Collaborative and game-based virtual environments can improve problem-solving skills and enhance active participation. A study by Rowe et al. (2011) concluded "a strong positive relationship between learning outcomes, in-game problem solving

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and increased engagement". Another study explained how collaborative learning approaches in 3D virtual worlds are more effective than teacher-directed instruction in facilitating intrinsic motivation, knowledge gains, and group performance (Cho & Lim, 2017). According to Munster (2015), Virtual reality may allow students to engage in various activities, such as undertaking simulated journeys through the universe or to Gettysburg, as well as interacting directly with a car engine. It also elaborated how "Virtual reality gives hands-on viewpoints which may help people better understand and retain a topic and learn to perform new tasks" (Munster et al., 2015, p.19). The validity of these studies can be reinforced by the dynamic character of technology and its capacity to propel discoveries to greater levels of scale than before. Tech giants have already started their preparations to meet the future of innovative, immersive digital technology. The much-deliberated VR headset Apple Vision Pro has been launched and is already creating a buzz among the inno-vigilantes. However, several alternatives are in the making, including Meta's Meta Quest 3 virtual reality headset, scheduled to debut at Meta Connect 2024. Xreal Air 2 Ultra augmented reality glasses provide features such as spatial computing and real-world object identification, while Asus AirVision M1 delivers USB-C connectivity. A cooperation between Samsung and Google is underway to produce an XR headset that will incorporate Qualcomm's XR2+ Gen 2 processor, enabling a resolution of 4.3K and integration of mixed reality passthrough. Headset, and its rivals like Meta's Quest 3S (Hector, 2024). These devices hold significant potential and might prove to revolutionise ELT classrooms by making them more interactive, reality-based, context-based and culturally relevant. Godwin-Jones (2023), in the work 'Presence and agency in real and virtual spaces: The promise of extended reality for language learning', explained how IID technologies can help develop various language skills:

- Listening: Through audio, video, and animated multimedia content
- Reading: Using interactive texts, electronic dictionaries, and digital reading materials
- Speaking: Via voice chat, speech synthesis, and virtual conversation partners
- Writing: Through blogging, social media interactions, and collaborative writing tools

5.2 Scope in Indian Scenarios

The world is striving towards achieving excellence in the field of education by backing it up with innovative and powerful methodologies that can revolutionise the future of classrooms and beyond. Countries like Finland, South Korea, and Japan have already started implementing IIDT in ELT classrooms. India is also maintaining pace with the digital literacy initiatives done with Zen, as mentioned earlier. The digital age has ushered in a new era of learning, where the Internet serves as a model for learning institutions, enabling worldwide communities to exchange ideas and learn from one another (Mallik & Mallik, 2017). As already discussed, with the rise of smartphone phone users reaching 1.55 billion by 2040 (Sun, 2023). It may be contended that this requirement is sufficiently stringent to start exploring the potential of virtual reality and augmented reality technology in several Indian classrooms. While these innovations show promise, challenges remain in implementation due to infrastructure and resource limitations (Uzdenova et al., 2020). The implementation of these technologies remains a challenge due to their exorbitantly high prices, considering the Indian context. However, a study by Munster et al. (2015) predicts a decrease in the costs linked to these technologies in the coming years, making them more cost-effective. However, this decrease is not anticipated to be significant since the technology will continue progressing, and virtual reality (VR) devices will be outfitted with more realistic features. Therefore, it is also important to look for more practical options that may equally improve language acquisition in a comprehensive and effective manner.

VI. CONCLUSION

After doing a deep analysis of various studies, this research concludes that English Language Learning in India is a complex task involving challenges with a multifaceted nature. Despite the various opportunities available and the integration of new technologies into ELT and education in general, it still lags when it comes to ground-level implementation. From bridging the gap between the rural-urban disparities to curating culturally relevant methodologies catering to the multilingual population, or even providing proper training to the instructors, it becomes difficult to target the specific issues and tackle them. Therefore, it is imperative for ELT practitioners to broaden their perspective and delve deep into research to -

1. Lay out reforms in the already existing

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practices in accordance with India's socio-cultural situation.

2. Integrate the already existing digital tools in a proficient manner.
3. Address the complexes among learners resulting from the uneven allocation of resources across different economic classes.

Moreover, it is necessary to pay attention to the rising demand for English at a global level due to its extensive use across fields. In addition to its high demand, there is a growing need to accelerate the learning process as well. People in the modern era aspire to quickly achieve fluency in English, reducing their time investment. Practitioners also need to look for effective methods that consume less time and cater to the needs of learners who want to learn English within a limited timeframe.

Now that we have transitioned into the realm of the digital era, a medium that has become popular among the masses, it becomes viable for us to start investigating the potential of technology in enhancing the teaching practices of ELT classrooms, bringing a revolution in the field of language learning. Alongside this, it is also crucial that the evaluation techniques undergo a transformation and align with the prevailing pattern of formative assessments instead of summative evaluations. In this regard, adaptive learning systems should offer real-time feedback throughout the learning process. The active involvement of communities and parents is also critical in assisting learners, especially in regions where English language acquisition is restricted. Furthermore, continuous teacher-training programs for instructors will ensure they possess digital literacy skills and enhance their overall effectiveness, enabling them to be more innovative and efficiently use technology appropriately. Hence, leveraging technology in ELL in an Indian context can significantly boost the learning and acquisition process if implemented appropriately and thoughtfully.

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Personalized Learning through AI: Enhancing Student Engagement and Teacher Effectiveness

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Abstract

The integration of Artificial Intelligence (AI) into education is transforming traditional teaching paradigms by fostering personalized learning environments. This paper explores how AI technologies enhance student engagement and teacher effectiveness. Key benefits include customized learning paths, real-time feedback, and data-driven insights. Challenges such as ethical considerations, data privacy, and teacher training requirements are also discussed. A mixed-methods study involving surveys, interviews, and performance analytics provides valuable insights into the effectiveness of AI-powered tools. The findings indicate that AI significantly improves engagement and teaching efficiency, although challenges in accessibility and equity remain. The paper concludes with actionable recommendations for optimizing AI adoption in education.

Keywords*— *Artificial Intelligence, education, personalized learning, student engagement, teaching efficiency

I. INTRODUCTION

The traditional one-size-fits-all approach to education often fails to address the diverse learning needs of students. Personalized learning, which tailors' educational experiences to individual student preferences, has gained attention as a promising alternative. AI plays a critical role in facilitating this shift by leveraging data analytics, machine learning, and adaptive technologies.

Despite its potential, the adoption of AI in education remains uneven, with concerns about accessibility, privacy, and teacher readiness.

This paper aims to:

1. Analyze how AI enhances student engagement.
2. Explore the impact of AI on teacher effectiveness.
3. Identify challenges and propose solutions for integrating AI into education.

II. LITERATURE REVIEW

The integration of Artificial Intelligence (AI) in education has been a transformative force, driving the adoption of personalized learning and reshaping the dynamics of teaching and learning. This literature review examines the key advancements, benefits, and challenges associated with AI in education, emphasizing its impact on student engagement and teacher effectiveness.

AI in Education: An Overview

AI technologies, ranging from adaptive learning platforms to intelligent tutoring systems, have revolutionized traditional educational approaches. According to Luckin and Holmes (2020), AI enables the creation of dynamic, learner-centric environments by analyzing student data and customizing content delivery. These technologies not only enhance individual learning experiences but also optimize classroom management by reducing teachers' administrative burdens.

The rise of AI-driven systems such as Duolingo, Khan Academy, and automated grading tools illustrates the potential of these technologies in fostering accessible and efficient education. Heffernan (2020) highlighted how adaptive learning systems cater to diverse student needs by adjusting the pace and difficulty of lessons, resulting in improved academic outcomes. Such systems provide a stark contrast to traditional methods, which often lack the flexibility to accommodate different learning styles.

Student Engagement Through AI

One of the most significant benefits of AI in education is its ability to enhance student engagement. Engagement is a critical predictor of academic success, and AI fosters this by creating interactive and immersive learning experiences. Gamification is a notable example, where AI-driven platforms use game-like elements to sustain student interest and motivation (Smith, 2021).

Real-time feedback is another feature that significantly contributes to engagement. AI-powered systems provide instantaneous responses to student queries and performance, allowing learners to correct mistakes immediately. Garcia and Feng (2019) found that students using AI tools reported higher satisfaction due to the personalized nature of feedback. This immediacy helps maintain a learner's focus and encourages continuous improvement.

Moreover, AI enables 24/7 access to educational resources, removing traditional time and location constraints. Patel and Singh (2022) observed that students in remote areas particularly benefit from AI's ability to deliver quality education regardless of geographic limitations. However, they also noted that disparities in digital infrastructure could hinder equitable access to these benefits.

Teacher Effectiveness and AI Integration

For teachers, AI is a valuable tool that enhances instructional effectiveness and efficiency. Automated grading systems, for instance, reduce the time teachers spend on repetitive tasks, allowing them to focus on lesson planning and student interaction. Dong and Wang (2021) reported a 40% reduction in administrative workload for teachers using AI-powered grading tools, which subsequently improved their capacity to engage with students on an individual level.

AI analytics provide teachers with actionable insights into student performance. By identifying patterns and predicting learning outcomes, teachers can implement targeted interventions for struggling students. Srinivasan and Peters (2020) emphasized that such data-driven decision-making transforms teaching from a generalized approach to a highly personalized one. This capability is particularly useful in classrooms with diverse learning abilities.

However, integrating AI into teaching practices presents challenges. Zhou and Lee (2021) discussed the need for comprehensive teacher training programs to ensure effective use of AI tools. Many educators feel unprepared to adopt these technologies due to a lack of technical knowledge and support. The authors argued that without proper training, the potential of AI to revolutionize education remains underutilized.

Ethical and Privacy Considerations

The adoption of AI in education raises critical ethical and privacy concerns. One of the primary challenges is the collection and use of student data. According to Brown (2022), the reliance on AI systems often involves extensive data collection, including personal and behavioral information. While this data is essential for creating personalized learning experiences, it also poses risks if misused or mishandled.

Algorithmic bias is another ethical concern. AI systems are only as unbiased as the data they are trained on, and biased algorithms can perpetuate or even exacerbate inequalities. For example, Williams (2021) highlighted instances where AI tools performed poorly for students from minority backgrounds due to biased training data. Addressing these issues requires transparency in AI development and a commitment to equity in education.

Accessibility and Equity in AI Adoption

While AI has the potential to democratize education, accessibility remains a significant barrier. Arora and Chen (2021) noted that schools in low-income regions often lack the resources to implement AI technologies effectively. Disparities in access to devices and internet connectivity create a digital divide, limiting the reach of AI-driven education.

To address this gap, Patel and Singh (2022) advocated for the development of low-cost, scalable AI solutions tailored to the needs of underserved communities. Initiatives to improve digital literacy among students and educators are also essential for bridging the divide.

Future Directions for AI in Education

The future of AI in education is promising, with advancements in natural language processing, machine learning, and adaptive technologies paving the way for more sophisticated tools. Chen and Hong (2021) emphasized the potential of AI to enhance inclusive

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education by supporting students with disabilities. Features like speech-to-text and augmented reality can create more accessible learning environments.

Moreover, interdisciplinary research is needed to address the challenges of AI adoption. As highlighted by Luckin and Holmes (2020), collaboration between educators, technologists, and policymakers is crucial to develop ethical, effective, and sustainable AI systems.

III. METHODOLOGY

- **Research-Design**:
  A mixed-methods approach, combining quantitative analysis of AI tools in educational settings and qualitative interviews with educators and students, was employed.
- **Data Collection**:
  1. Surveys with 500 students and 50 teachers from schools using AI tools like Duolingo and Khan Academy.
  2. Interviews with 20 educators to understand the challenges of AI integration.
  3. Analysis of academic performance metrics (e.g., grades, engagement metrics) before and after AI adoption.
- **Sample-Population**:
  Participants were drawn from urban, rural, and semi-urban schools to ensure diversity.

IV. RESULTS AND DISCUSSION

4.1. Student Engagement

- **Survey Findings**:
  1. 85% of students found AI tools engaging, citing features like gamified learning and immediate feedback.
  2. 70% of respondents reported an increase in their time spent on self-directed learning.
  3. Students using AI platforms scored 15% higher on standardized tests compared to their peers.
- **Interview-Insights**:
  Educators observed greater enthusiasm among students when using AI tools, especially for subjects like mathematics and languages.

4.2. Teacher Effectiveness

- **Quantitative Analysis**:
  - Teachers reported a 40% reduction in administrative tasks due to AI-driven automation.
  - Classrooms with AI tools demonstrated a 20% increase in personalized interactions between teachers and students.
- **Qualitative Data**:
  Teachers expressed that AI analytics helped identify struggling students faster, allowing for timely interventions.

4.3. Challenges

- **Data Privacy**:
  60% of teachers expressed concerns about sharing sensitive student data with third-party platforms.
- **Training Gaps**:
  Only 30% of teachers felt adequately trained to use AI tools effectively.
- **Infrastructure Barriers**:
  Schools in rural areas reported inconsistent access to devices and internet connectivity, limiting AI's impact.

Table 1: Matrix Representation of Improvement

Metric	Before AI	After AI	Improvement
Average Test Scores	68%	78%	+10%
Engagement (Hours/Week)	4	6.5	+2.5 Hours
Teacher Time on Admin (%)	50%	30%	-20%

V. RECOMMENDATIONS

- **Policy-Recommendations**:
  Governments should establish robust data privacy frameworks and incentivize AI adoption in schools.
- **Training-Programs**:
  Offer professional development courses for teachers to enhance their technical proficiency in AI tools.

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- **Equity-in-Access:**
  Develop low-cost AI solutions to bridge the digital divide in underserved communities.

VI. CONCLUSION

AI is revolutionizing education by enabling personalized learning, improving student engagement, and enhancing teacher effectiveness. While challenges such as ethical considerations and infrastructure gaps persist, the potential benefits of AI in education far outweigh the risks. Future research should focus on longitudinal studies to assess the long-term impact of AI on educational outcomes.

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The Challenging Role of Public Libraries in the Perspective of NEP 2020

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Abstract

The National Education Policy (NEP) 2020 represents a paradigm shift in India's education system, emphasizing inclusive, equitable and lifelong learning. Public libraries have been positioned as critical "learning and resource centres" in integrating formal and self-directed education while fostering literacy, skill development and digital empowerment. Lifelong learning, as envisioned in the NEP 2020, encompasses both formal and non-formal learning processes aimed at enhancing individual and societal well-being. This study pointed to the role of public libraries in implementing the lifelong learning framework of the NEP 2020, highlighting challenges such as resource constraints, skill gaps among staff, limited community collaboration and accessibility issues. It also explores opportunities for libraries to become dynamic hubs of adult education and lifelong learning through modernization, community-focused programming, and improved policy support. Recommendations include fostering partnerships with educational institutions and local organizations, equipping librarians with expertise in ICT and pedagogy, upgrading infrastructure, and developing inclusive, vernacular-rich collections. The study underscores the transformative potential of public libraries in shaping a knowledgeable and self-reliant society by aligning their services with the goals of NEP 2020 for lifelong learning and cultural preservation.

***Keywords*— NEP 2020, lifelong learning, public libraries, skill development, digital empowerment**

I. INTRODUCTION

NEP 2020 makes an amazing change in India's education landscape, with an emphasis on inclusive learning and equitable access to knowledge. Libraries, especially public ones, are envisioned as "learning and resource hubs" that are integral to lifelong learning. Public libraries occupy a unique position in society, providing a bridge for organized and self-directed learning, thereby fostering knowledge dissemination and literacy. Lifelong learning—defined as continuous, self-motivated learning throughout life—aims to enhance individual capabilities and the well-being of society. Highlighting their role in nurturing literacy, skill development, and digital empowerment, NEP 2020 underscores public libraries as spaces to support this mission.

Objectives

This study aims to:

- Examine the concept of lifelong learning within the NEP 2020.
- Highlight the role of public libraries as spaces for lifelong learning.
- Identify the challenges and opportunities for public libraries in fulfilling this role.

II. METHODOLOGY

The study adopts a qualitative approach, reviewing relevant literature, journal articles, conference papers,

and sources from organizations such as IFLA and RRLF. It also incorporates findings from web-based research focusing on library policies, NEP 2020 proposals, and studies on lifelong learning.

The concept of lifelong learning in NEP 2020

The concept of lifelong learning in NEP 2020

Lifelong learning encompasses both formal and informal learning processes throughout an individual's life. It enhances skills, knowledge and abilities and contributes to personal fulfillment and professional growth.

NEP 2020 outlines a structured program for adult education, emphasizing:

1. Fundamentals of Literacy and Numeracy
2. Critical life skills including financial and digital literacy
3. Employment skill development
4. Basic Education (Preparatory to Secondary Level)
5. Further education such as courses in arts, culture and sports

Public libraries are vital to achieving these goals, offering infrastructure, trained instructors, and accessible resources. However, challenges such as limited funding, outdated collections, and insufficient collaboration hinder their potential.

The public library is a place for lifelong learning

Libraries can be considered as a supplement to the classroom and the traditional textbook. According to the UNESCO Public Library Manifesto, one of the twelve missions of public libraries is to 'ensure access to all forms of community information for citizens'. In this information age, making information easily and quickly available to all citizens will enhance the development of a society. It is a fact that proper utilization of information can improve the quality of life of an individual and thereby the society. Being a social institution closely related to the community, public libraries have the responsibility to develop people's lives through access to all forms of information and entertainment available from books and various other resources. Public libraries act as knowledge archives, social interaction centers, information retrieval centers etc. It is also a lifelong learning center that serves as a local gateway to knowledge and provides a foundation for adult education, lifelong learning, and cultural development. Public libraries in a society can act as nodes connecting local learning settings with global learning resources, thus playing a fundamental role in the development of future systems of lifelong learning. Public libraries play an important role in supporting the learning process because lifelong learning is characterized by informal learning components, flexible learning opportunities, and a shift toward self-directed learning. Public libraries have staff, information resources, physical and virtual space that are easily accessible to all and provide lifelong learning opportunities, no matter who you are or where you are in life. Not compulsory, but inclined.

Realizing the importance of libraries in the education sector, NEP 2020 focuses on: development of attractive learning materials, ensuring availability of books and e-resources in school/public libraries, promoting reading habits across the country, and implementing ICT in schools/villages. Strengthening library collection for public libraries, higher education systems, setting up public library spaces for adult education, creating appropriate in-service training for library staff, etc.

Challenging role of public library in view of NEP 2020

In this information age, one of the main functions of a public library is to provide up-to-date information needed by all sections of society. Today, while some public libraries act as catalysts for information exchange in society, the work of many public libraries is progressing in a sluggish manner. Very few users come to the library and use library resources. Many libraries are in a situation where they have to write false reports for funding. Although institutions like RRLF allocate a lot of funds for the development of public libraries, it is often not utilized effectively. This requires a change for the implementation of NEP 2020. As stated by the NEP, information resources need to be improved and the knowledge of librarians needs to be improved and utilized. By making the public library a space for lifelong learning, NEP challenges public libraries to become an ideal infrastructure for providing information through trained and qualified instructors, with the participation of community people and improving the availability and accessibility of information resources. The NEP argues that all libraries should have a vernacular book collection to provide better adult education. But there is a problem such as space and money to collect rich information. In this context, libraries need to form a network connection with various public libraries and global networks that provide information to users. Along with this, the cooperation of public libraries and

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communication with the local community, e.g. Various educational institutions, local trade, industry and health and environmental authorities create a strong information network and increase information exchange. We keep in mind that the value of libraries is not only based on their physical collection, but also on the skill level of their staff to provide services offline and online. So we can summarize the challenges posed by NEP as follows

- Modernization of libraries with adequate information and communication technology
- Provide up-to-date information needed by all sections of the society.
- To create information networks with local institutions
- To improve cooperation, collaboration and communication with the local community, e.g. Various educational institutions, local trade, industry, health and environment authorities etc.
- To provide guidance and training in information searching and quality rating of information sources.
- Upgrade the librarian's professional profile, for example skills in information retrieval, pedagogy and ICT
- To promote reading habit through mobile library, seminar, cultural events etc.

III. FINDINGS

In the perspective of NEP 2020, the public library can be considered as a center of lifelong learning. Public libraries in India face many challenges in implementing the narratives of adult education or lifelong learning.

Challenges facing public libraries

Public libraries face several barriers to becoming centers of lifelong learning:

- Resource constraints: limited collections, inadequate digital resources, and outdated infrastructure.
- Skills gaps: library staff often lack training in ICT, pedagogy, and user engagement.
- Community collaboration: weak relationships with local organizations and educational institutions.
- Accessibility issues: inadequate communication to marginalized communities and remote areas.

These challenges include implementing good collection development, availability and accessibility of information resources provided by public libraries, and adequate cooperation and training of library staff. To overcome these challenges, the public library system should focus on the following:

1. Enhanced collaboration: Strengthen partnerships between libraries, educational institutions, and local organizations.
2. Training and capacity building: Equip librarians with expertise in ICT, pedagogy, and community engagement.
3. Upgrade infrastructure: Upgrade facilities to include digital resources and spaces for social interaction.
4. Community-centric programs: Programs designed according to local needs, fostering greater participation.
5. Policy support: Advocate for policies that integrate public libraries into the national education framework.

Suggestions

- Stimulate cooperation and interaction of public libraries with the local community and implement networking between public libraries and educational institutions and organizations.
- Use the framework designed by NEP 2020 for developing pedagogical methods and strategies suitable for adult education and for specific groups.
- Establish public library system near more crowded places like hospitals and railway stations
- Develop public libraries near specific places like village offices and agriculture offices to collect information considering the needs and accessibility of information.
- Strengthen the professional profile of librarians through continuing education on skills in information retrieval, pedagogy, didactics and ICT.
- Emphasize the role of public libraries in the preservation and public presentation of cultural heritages, e.g. oral tradition and vernacular.
- The application of Information and Communication Technology (ICT) in libraries works with lifelong learning.
- Develop adequate collection management of information resources such as books, newspapers, electronic media and audio-visual media with a balance between them.
- Create awareness about the relationship between the interior design and internal structure of public libraries and an environment conducive to

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learning and education, and make necessary changes in libraries, workspaces, etc. to attract the user community.

IV. CONCLUSION

The study provides insight into the problems faced by public libraries, including lack of reading habits and lack of time, which seriously affect the functioning of public libraries. Although a lot of funds are being spent in various ways for the development of public libraries, the authorities should check whether they are being utilized properly. Similarly, the government authorities should take all necessary steps to strengthen the library. The use of the library will be effective only if it is for the benefit of the users. Setting up libraries at places like railway stations, hospitals, providing timely training to librarians, and appointing librarians who are capable of providing accurate information, should be taken care of while making the public library a center of lifelong learning. To achieve their goal of lifelong learning in this information age, public libraries should build strong collaboration and partnership with various educational institutions and local and global information systems. Skilled and qualified librarians play an indispensable role in effectively integrating the role of public libraries as a center of lifelong learning.

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