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Education Via ICTs: Knowledge and Comprehension in the Age of Electronic Communication

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ABSTRACT

Electronic media has been recognized by large, decentralized scientific and engineering organizations with headquarters in North America and Europe as a critical tool for communication and information sharing with members and other stakeholders. The greatest technical society in the world, the Institute of Electrical and Electronics Engineers, realized that it was becoming more and more dependent on electronic media and ordered a research to evaluate the effects this change would have on its members and other stakeholders in the social, organisational, and economic spheres. The lack of conceptual underpinnings in ICT impact assessment has contributed to its current state of absence or poor quality. To illustrate where such foundations might originate, this editorial lays out the intellectual origins of the newly-emerging sub discipline of "development informatics." Additionally, it provides an overview of the conceptual contributions made by each work in Policy Arena. Sen's capability theory, enterprise value chain models, and empowerment models are used in the articles to illustrate how ICTs contribute to ideas of development that include economic growth, sustainable livelihoods, and freedom. The editorial offers a good practice summary based on experiences of both success and failure, since not all ICT endeavours are successful. It goes above and beyond the adage that practitioners and legislators should always include impact evaluation in this beneficial activity.

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1. INTRODUCTION

A country's foundation is its education system. Even though they are aware of this, a sizable portion of the population in the least developed nations cannot afford higher education. The underdeveloped economies of those nations can be one of the main causes. Maybe this is the most important issue for those countries to deal with in order to progress generally, with education possibly ranking highest. The production and provision of goods and services at comparatively lower costs, as well as the expansion, are significantly aided by information, knowledge, and communication technology.

When ICTs are used wisely, they can process information, build databases, and make them accessible anytime, anyplace. However, information and communication technologies (ICTs) have a great deal of success in most circumstances in delivering services at lower costs to people's doorsteps, even in countries with relatively weak economic conditions. ICTs have the same role in lowering the cost of higher education and making it accessible to all socioeconomic groups across the nation. People will so benefit from having access to higher education as well as acquiring the knowledge, expertise, and experiences needed to support and flourish from the country. It is rare to find a nation in the twenty-first century where online learning is not an option for higher education. In actuality, it has been used for a very long time. However, with the current ICT revolution,

distant learning for higher education has become more widely recognised and more feasible for individuals worldwide. These days, it's referred to as virtual learning. People in industrialised nations are becoming more interested in learning on virtual campuses than they are in traditional brick-and-mortar campuses. A virtual campus is simply an ICT-enabled school where students can attend classes, communicate with teachers, access learning materials, take exams, join forums or clubs, turn in assignments, and more all virtually. It also allows for real-time interactions between teachers and students.

The impacts of technology diffusion are a topic of interest and significance, given the explosive growth in the usage of electronic media for communication and information distribution. In relation to organisations, the social effects of technologies like electronic mail (e-mail) are especially significant. Professional scientific and technical associations like the Institute of Electrical and Electronics Engineers are among the several organisations that are finding it difficult to keep up with these repercussions [1]. Founded in 1884, the IEEE is a non-profit organisation whose goal is to promote the theory and practice of computer science, electrical engineering, and electronics by funding local meetings, technical publications, conferences, and member continuing education initiatives. The IEEE is comparable in scope and function to other scientific and technical societies like ASME International (mechanical engineering), the American Society of Civil Engineers, and the American Institute of Chemical Engineers, the Association for Computing Machinery, the American Chemical Society, and the American Physical Society, despite being the largest technical professional society in the world with over 320,000 members.

The three main areas of electrical and electronic engineering—computers, communications, and power engineering—are represented by the greatest technical associations. Smaller societies concentrate on technical specialities like lasers, electro-optics, and electron devices; the "human environment" like engineering education and the social ramifications of technology; and applications of electrical and electronic engineering in domains like aerospace engineering, biomedical engineering, and consumer electronics.

As illustrated in Figure 1 [2], we created an instructional design known as the reflective teaching model for reading comprehension after taking the reflective teaching process and reading variables into account. This model served as the conceptual foundation for our investigation. We often hear about how knowledge is becoming the foundation of society and how knowledge-based abilities are gradually taking the place of labor-based, physical skills in many spheres of life [3]. We frequently hear about the post-industrial revolution, also known as the electronic or digital revolution, which is having a significant impact on knowledge creation and learning processes and unexpectedly changing the world. Even though a lot of what we hear is accurate, we must remember that information has always been valued and sought after in many parts of the world.

"Whereas a ruler was respected within his own country, the learnt were honoured wherever they went," an ancient Tamil poet once said. One of the oldest texts still in existence, the Rig Veda, says, "Let noble thoughts come to us from everywhere." In order to continue "to strive, to seek, to find and not to yield" in his lifelong quest "to follow knowledge like a sinking star, beyond the utmost bound of human thought," Ulysses placed his son Telemachus in charge of the daily tasks of rule.

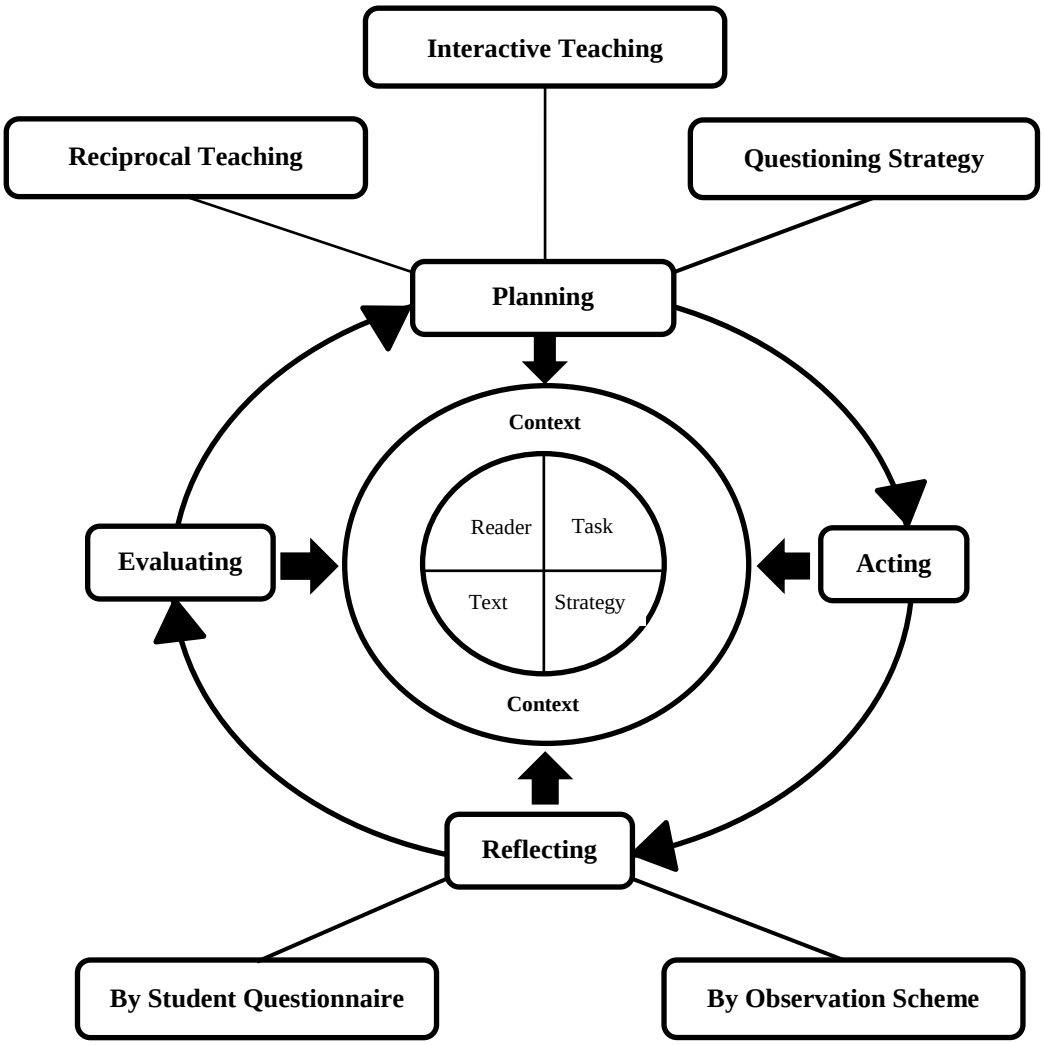

Figure 1. Conceptual Structure

The following points to the rest of the document. Section 2 provides some basic information regarding ICTs in education. In Section 3, we outline our suggested design for the comprehension in the era of technological communication. The installation of several gates is shown in Section 4, along with the experiment's findings, a comparison of our selected design, and a correlation with the information provided in Section 5.

2. RELATED WORKS

Information and communication technologies (ICTs) are anticipated to play a critical role in the development of mental health in developing nations. Many believe that these technologies have the power to transform unprofitable sectors of the economy and dysfunctional public administration, as well as to open up previously untapped markets for information-intensive social services like healthcare and education [4]. However, it is commonly recognised that attaining these developmental benefits has proven challenging due to numerous intricate factors. Here, there are two connected issues. Initially, numerous organisations struggle to maintain and develop intricate technological projects for the extended durations usually needed.

It is a fallacy to infer any innovation's use and impact on a larger scale from the behaviour and excitement of early adopters. But this seems to have been done for ICT in education in a lot of the recent writing [5]. Longer-term research on ICT use in HE instruction is required in order to analyse the behaviour of resisters as well as late adopters. Although a general cycle of technology adoption may be predicted and explained by this paradigm, it is unable to explain why some tools and technologies are adopted as intended while others are not. However, the reasons behind the unique adoption trajectory of each technology can be better understood when combined with an explanatory theory that focuses on the special relationships between the elements of any technological system or tool use—in this case, activity theory.

Pre-schoolers are "learning optimists," according to numerous studies, who place a high value on their own talents, undervalue the difficulty of tasks, and have optimistic success expectations. Children start to differentiate between effort [6], skill, and outside influences while attempting to explain their success in middle childhood. The way individuals interpret their accomplishments and shortcomings in activities affects the probability of forming an innate drive to persevere through difficult assignments and the growth of efficient metacognitive abilities.

ICT for education proponents contend that modern teaching methods and learning are essential to preparing pupils for the real world and any careers they may choose. The discourse surrounding information and communications technology is characterised by a variety of patterns, including how-to manuals, program testing and implementation, policy development for use, funding initiatives, and other topics that presume acceptance, use, and benefits as givens. ICT providers [7], related educational material producers, government representatives, and administrators of educational institutions have enthusiastically united by forming alliances, locating funders who support their cause, and crafting laws that help turn technological fantasies into increasingly tangible reality.

ICT is crucial in assisting students in locating reading materials from authentic sources. Students only need to sit in front of computers connected to the internet network to find papers from foreign journals. ICT makes the process of teaching and learning easier by giving users access to a greater range of articles and information sources [8]. ICT in education promotes a learner-centred approach since it allows students to access and use these tools at their own pace, which helps them become more independent learners. Conversely, reading serves as the foundation for studying a variety of subjects. Regardless of the facet of life being examined, it is evident that proficient reading skills augment an individual's capacity to operate with efficacy. It's a competency in speaking English as a second language.

However, learning environments with technology integration present a viable path for learning analytics-based integrated evaluation of the more behavioural and complicated aspects of Key Competencies. The development of general skills is made possible by the fact that many of the technology-enhanced learning settings, tools, and systems currently in use replicate learning circumstances that call for sophisticated thinking, problem-solving techniques, and teamwork [9]. A portion of these settings enable educators and students to evaluate performance, comprehend errors, and draw lessons from them.

Drawing from the 2015 findings of the Program for International Student Assessment (PISA), the aim of the present research is to assess the impact of Spanish students' academic performance on the use and availability of Information and Communication Technologies (ICT) at home and at school [10]. The idea that ICT improves academic performance is specifically what has to be investigated. Analysing and evaluating the effectiveness of elements that may have an impact on the quality of education is made possible by looking at a variety of variables linked to students' and schools' use of ICT.

3. METHODS AND MATERIALS

3.1 Applying ICTs

While using ICTs to conduct educational programs won't always help with internationalization [11], it does give staff and students a variety of alternatives.

After outlining the potential benefits of ICTs for deeper forms of internationalisation, Duke argued that while these developments have great potential to strengthen and deepen internationalisation, it is not a "natural or automatic process" and pointed out some of the drawbacks. As a matter of fact, he came to the conclusion that they are "essentially neutral—and aid to the service of almost any individual and institutional purpose." So how can we use ICTs to help achieve internationalisation goals? Distance and time are, in theory at least; no longer barriers to international exposure and awareness for any student with access to a computer and a modem, since all students use the Internet to access information, connect with teachers, and interact and collaborate with other scholars and learners throughout the world. If ICTs are employed to internationalise the curriculum's content and teaching and learning methodology, then every student may be able to enjoy an international experience. Among these chances are staff and student participation in

- Utilising technology to create global networks and contacts within the field or profession;
- Virtual visits from internationally renowned guest lecturers and presenters who, at the right intervals throughout the program, address particular themes or respond to particular questions online;
- Projects for individuals and groups that centre on global challenges, case studies, and/or exemplars;
- Assignments that call for the development of interpersonal skills and the building of working relationships with individuals from a variety of cultural backgrounds, such as those that involve the analysis of media reports from foreign newspapers from various cultural viewpoints, online interviews with students from other cultures, and/or professionals who have worked abroad;

- Finding, debating, analysing, and assessing data from a variety of foreign offline and online sources;
- Online Resources for analysing the problems, approaches, and potential fixes related to hot-button issues in the field from a variety of cultural viewpoints;
- Accessing international internet resources including professional associations, conference proceedings, and journals; and
- Online simulations that give students the chance to take part in and learn from intricate and dynamic cross-cultural role plays in a safe online setting.

But in order to fully realise the social and cultural advantages of having a varied student body in an online setting, students must be obliged to participate in and be rewarded for their involvement in activities like these through the official assessment system.

- synchronous or asynchronous online discussion forums that bring together students from various cultural backgrounds to help them finish assignments, work through challenges, get perspectives from other countries on difficulties, and build global networks within the field;
- an online forum (debate room) where they can (and must) talk about regional and cultural variations in the discipline's guiding principles and assumptions, as well as how these might influence individual behaviour [12];
- a variety of group projects for evaluation that call for them to collaborate virtually or through email with members of various cultural groups in order to compare and contrast viewpoints on related professional topics; and
- online group tutorials that explore how differing cultural interpretations of social, scientific, or technical uses of knowledge can benefit or hurt members of different cultural groups.

3.2 The Impact of Education Commodification

Contemporary ICT-based education is designed more for the market than for citizens, making it a socioeconomic commodity. Through academic consultancies, the majority of the institutions sell the knowledge that their academics possess. Economic factors are used to evaluate and analyse academic activities and their results in the global era. A type of research commodification in science is the scientific research patent; in social science, research commodification takes the form of contract research. The commodification of business studies takes the shape of business consulting. Education grew more and more commoditized as a result of the socialism economy's decline and the rise of the capitalist economy, which also reduced government financing for education and its public and private participation (PPP) policy. The modern educational system uses market concepts and practices along with capitalism philosophy. It is a knowledge-based economy, with technology playing a major role. ICT-based instructions is depicted in Figure 2.

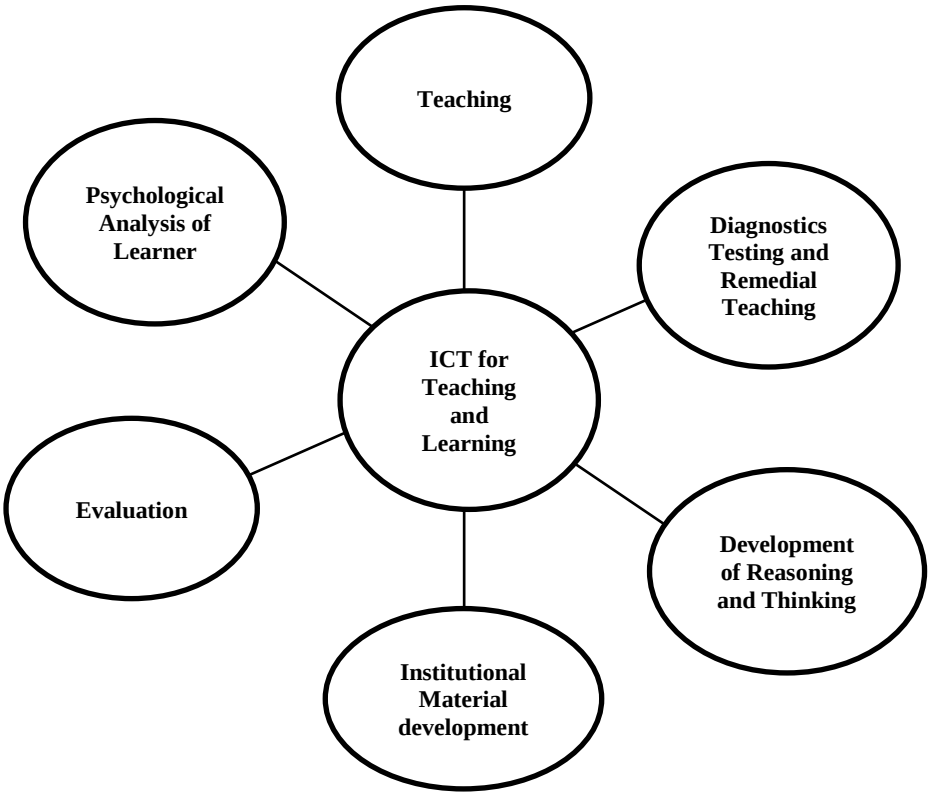

Figure 2. ICT-Based Instructions

3.3 ICT and the change process

3.3.1 Education and Learning

Whether technology will improve or worsen our lives is a matter that no one gets to decide. This "thought" ought to linger longer. The value, worth, significance, and delivery of educational amenities have all been redefined by ICT [13], and it is well on its way to altering future principles, practices, policies, and fundamental epistemological difficulties.

Without a doubt, information and communication technology (ICT) is a useful resource for teaching and learning. Tensions over ownership, procedure, content, and other terms and conditions of usage have emerged as a result of the global economy's rapid expansion and the rise of online education. The majority of the time, decisions is made by entities whose roles are isolated from those involved in teaching, learning, and knowledge creation. It has taken a while for issues like curricular hegemony, intellectual property, copyright, education corporatisation, learning and teaching operations, knowledge production, and transformation to gain widespread recognition and conversation before taking concrete action.

These assertions elicited derisive responses, primarily from individuals with financial and political ties to education in its broadest sense. Robust defences against the current and foreseeable uses of ICT as a message, messenger, and medium incorporate inherent counterattacks with hidden consequences that call into question the critical acumen, utility, and acuity of any fault-finding writer.

To challenge the ICT reality is to face the label of neo-Luddite. Following Ned Ludd to England, the actual Luddites destroyed weaving machines in 1811 and 1812 due to the threat that this specific technology posed to jobs and security. The Luddites' crude weapons of technological destruction were overmatched by the machinery of business, industry, and politics. The majority faced legal action, disdain, and imprisonment.

Both life and technical advancement continued.

4. IMPLEMENTATION AND EXPERIMENTAL RESULTS

4.1 Test Reliability and Fit Statistics

In order to look into the item fits and model reliability of the test for both the experimental and control groups, we also performed a second Rasch analysis. The results showed that the sample data can be used to investigate the effect of RTMRC on student reading comprehension achievement [14, 15]. The mean measures (logits) were 214.60 from items and 25.10 for individuals in the experimental group, and 206.30 for items and 24.50 for individuals in the control group. The positive standardised deviation values further support this finding.

Table 1 demonstrates that the person and item reliabilities are both acceptable. Furthermore, both the experimental and control groups' internal consistency reliability values, as determined by Cronbach's alpha (KR-20), were higher than 0.80, demonstrating the strong dependability of the test items. Both the experimental and control groups' item separation indices, which varied from 0 to 4, indicated that the items were beneficial for the test device.

Table 1. Test Fit and Reliability Statistics for Both the Experimental and Control Groups

CONSTRUCT	EXPERIMENTAL GROUP		CONTROL GROUP	
	ITEMS	PERSONS	ITEMS	PERSONS
Number	29	230	29	232
Mean	213.62	25.12	206.32	24.52
Standard deviation	72.02	3.82	70.32	3.62
Reliability (Cronbach's alpha)	0.95	0.76	0.96	0.72
Separation	1.34	1.82	1.41	1.52
MNSQ (infit)	0.96	0.101	0.9101	0.99
MNSQ (outfit)	0.97	0.97	0.98	0.98
ZSTD (infit)	-1.22	-0.12	-1.72	0.02
ZSTD (outfit)	-1.32	-0.32	-1.32	-0.12
Chi-squard ($X^{2)}$	7888.69		8126.13	
df	5955		5913	

The MNSQs-infit/outfit and ZSTDs-infit/outfit measures were also examined in order to look into the item fits among the test constructions. According to Table 1, the MNSQs-infit/outfit values and the associated ZSTD values fell within the designated acceptable limits of 0.6 to 1.5 (MNSQ). The test was nearly standard for assessing students' reading comprehension, as indicated by the Chi-square values by the degrees of freedom being less than three.

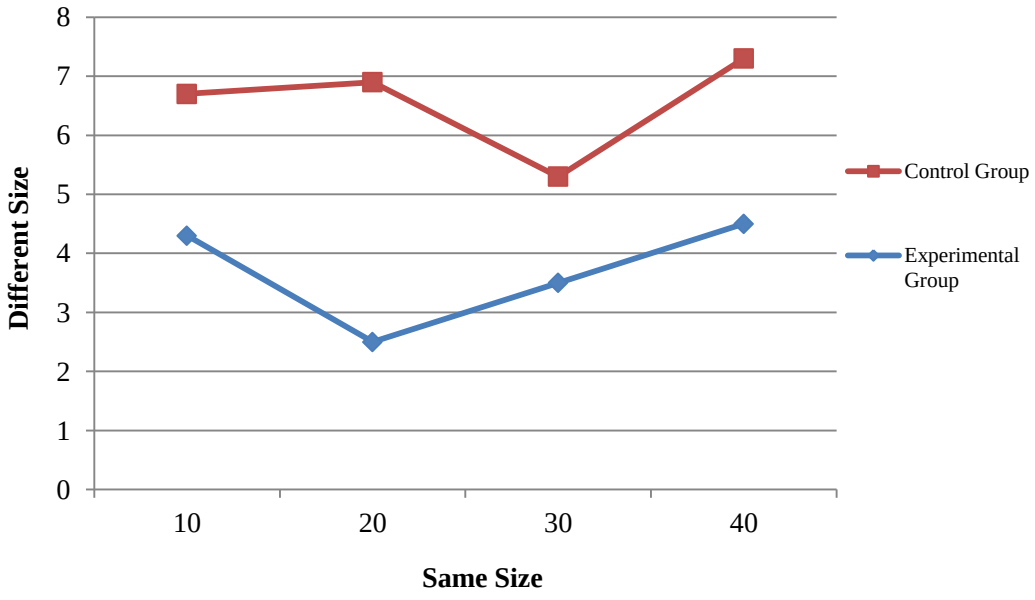

Figure 3. Test Items that Work Differently for the Two Groups

This research used a type of DIF analysis known as uniform DIF analysis to determine whether there was any test item bias between the experimental and control groups. In order to do the DIF analysis, participant

responses to each test item for these two distinct groups had to be assessed. The results indicated that the test's DIF sizes fell between +0.40 to −0.40 for both groups, and that the significance level was less than 0.05 (Figure 3). Consequently, it may be assumed that the test stays invariant and that the DIF between the experimental and control groups is not affected in any way.

Table 2. Considering pretest values as a covariate, adjusted and unadjusted group averages and variability for reading achievement (post-test).

		UNADJUSTED		ADJUSTED	
GROPUS	**NUMBER**	**MEAN**	**STANDARD DEVIATION**	**MEAN**	**STANDARD ERROR**
Experimental	330	47.15	6.82	45.22	0.37
Control	332	38.92	5.78	40.47	0.33

The average values and variance for the experimental and control groups' reading comprehension skills were also shown in Table 2, both before and after correcting for variations in pre-test scores. According to the statistics, the experimental group—which had undergone RTMRC treatment—performed better than the control group in terms of reading comprehension achievement.

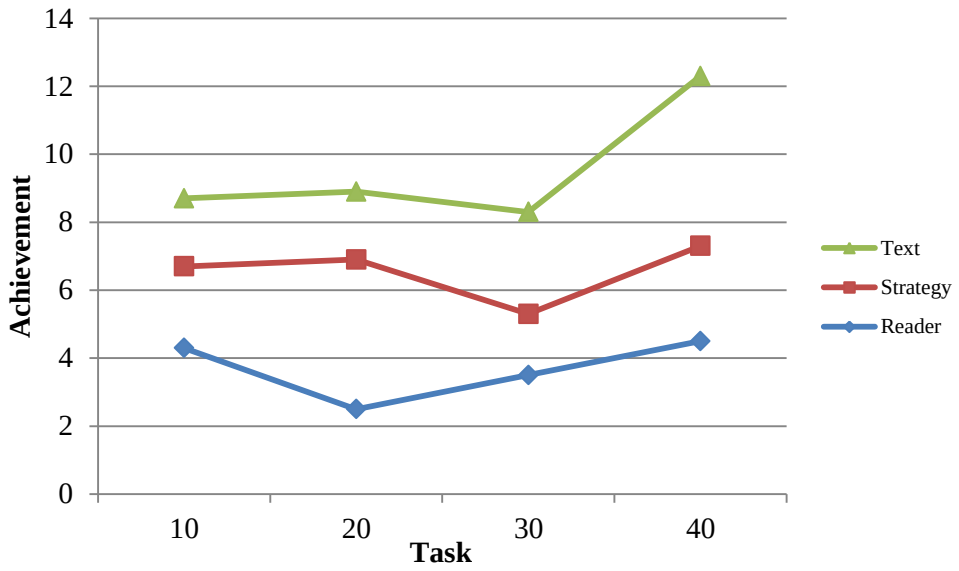

Figure 4. Relationship Model between Student Achievement and the Student Questionnaire

Student achievement and student questionnaire relationship is represented in Figure 4. Students concurred that their teachers' reading strategies assisted them in remembering the terminology when the reciprocal teaching style was used. The method used by their lecturers to clarify reading texts with pertinent questions was also well-liked by the kids. Additionally, it was clear that the students enjoyed taking part in the various reciprocal teaching activities, such as asking, summarising, clarifying, and forecasting. But some teachers, according to the kids, spoke too gently when trying to supervise the classroom.

During classroom management, the teachers were able to project their voices by utilising interactive and questioning tactics. The majority of pupils found the reading and teaching methods employed by their teachers to be enjoyable. The students preferred the interactive teaching approach the best, according to an examination of the item I appreciate the way the English instructor uses to teach the reading passages. 93.2% preferred interactive teaching, while 89.5% preferred the questioning technique and 83.2% preferred reciprocal teaching.

The students found the reading texts to be engaging and simple to understand when reciprocal teaching was applied. They were also able to identify discussion-worthy questions in the text. Furthermore, even though some students found the reading passages challenging and were unable to summarise the passage by identifying its main themes, the majority of students were able to understand the reading comprehension exercises. The

teachers clarified the reading passages' main themes during the subsequent interactive teaching and reciprocal teaching sessions, which improved the students' comprehension.

5. CONCLUSION

The strict application of textbook material, together with its high level of complexity and diversity of content, deters students from becoming motivated since it makes it difficult for them to understand concepts and apply the subjects they are studying to real-world situations. The results demonstrated that pupils preferred the flexibility of an ICT-based learning environment. It needs to concentrate on providing teachers with advanced training, implementing cutting-edge pedagogies, building institutional networks and ICT infrastructure, and improvising the collective standard of education by reducing the disparity in quality and access to technology between the rural and urban populations. It needs to be in line with the country's educational objectives and research and teaching practices.

Technology investments are recurring costs that must be upgraded or replaced as devices near the end of their useful lives and infrastructure equipment becomes antiquated. Thus, the planner needs to view technology as a continuous, line-item expense. It also needs to be aligned with learners' futuristic expectations and tested and evaluated on a regular basis in a variety of formats. All things considered, the RTMRC strategy significantly and favourably impacted students' reading comprehension performance. The majority of English language instructors in Myanmar lack professional development training, and they frequently employ traditional teaching techniques. It is crucial that all English language teachers adopt the RTMRC approach in order to teach reading comprehension because it can be used with any teaching strategy. It is advised that future studies that investigate, categorise, and contrast different kinds of instruction for English as a second language teachers make use of the RTMRC paradigm.

Finally, it needs to be updated and redesigned in accordance with recognised and established academic work procedures, data banks, student and teacher feedback, and new research. ICT must be objective in order to support self-paced, self-assessed, and self-directed learning as well as the creation of forward-thinking policies for social justice and academic advancement. The comprehensive character of education necessitates leadership, and joint efforts must be made in order to achieve it.

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