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Empowering School Girls through E-learning Tools: A Study of ELT Effectiveness in Telangana's Educational Landscape

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Abstract

This study examines the impact of e-learning tools on English Language Teaching (ELT) effectiveness and empowerment outcomes among school girls in Rangareddy district, Telangana. Using a mixed-methods approach, data were collected from 280 girls aged 13-17 years across 18 schools over 15 months. The research compares traditional ELT methods with technology-enhanced learning using platforms like Duolingo, Unacademy, and HelloEnglish. Results demonstrate significant improvements in English proficiency among e-learning users ($M = 82.4$, $SD = 11.7$) compared to traditional instruction ($M = 67.8$, $SD = 13.9$), $t(278) = 9.12$, $p < .001$. Beyond academic gains, the study reveals enhanced self-confidence, digital literacy, and aspirational outcomes among participants. Findings suggest that strategic implementation of e-learning tools can serve as a catalyst for educational empowerment of school girls in semi-urban and rural contexts of Telangana.

Keywords: English Language Teaching, e-learning tools, school girls, empowerment, Rangareddy district, gender education, digital literacy

1. Introduction

The empowerment of girls through education remains a critical development priority in India, with English language proficiency serving as a key determinant of future opportunities and social mobility (Malhotra et al., 2022). Rangareddy district in Telangana, encompassing both urban peripheries of Hyderabad and rural communities, presents a unique context for examining how digital learning tools can transform English Language Teaching (ELT) outcomes for school girls.

Historically, girls in semi-urban and rural areas of Telangana have faced multiple barriers to quality English education, including limited resources, traditional gender roles, and inadequate teaching methodologies (Rao & Padmaja, 2021). The emergence of accessible e-learning platforms offers unprecedented opportunities to overcome these challenges while simultaneously building digital competencies essential for 21st-century success.

Rangareddy district, with its diverse socioeconomic landscape and proximity to India's technology capital, provides an ideal setting to investigate how e-learning tools can democratize English language

learning for girls. The district's unique position—bridging urban technological advancement and rural educational challenges—makes it representative of broader transformation patterns across developing regions of India.

1.1 Statement of the Problem

Despite significant policy initiatives promoting girls' education in Telangana, English language proficiency among school girls in Rangareddy district remains suboptimal, particularly in government and aided schools (Department of Education, Telangana, 2022). Traditional ELT methods often fail to address the specific learning preferences, confidence barriers, and aspirational needs of adolescent girls in this socio-cultural context.

The digital divide further compounds these challenges, with girls having limited access to quality educational technology compared to their male counterparts (UNICEF India, 2021). However, the increasing penetration of smartphones and internet connectivity in the region presents new possibilities for inclusive, gender-responsive English language education.

1.2 Research Objectives

This study aims to:

1. Evaluate the effectiveness of e-learning tools in improving English language proficiency among school girls in Rangareddy district
2. Assess the empowerment outcomes of technology-enhanced ELT beyond academic achievement
3. Identify gender-specific factors that influence successful adoption of e-learning tools
4. Examine the digital literacy development resulting from e-learning platform usage
5. Provide evidence-based recommendations for scaling gender-responsive ELT interventions

1.3 Research Questions

The study addresses the following research questions:

1. How do e-learning tools impact English language learning outcomes among school girls compared to traditional teaching methods?
2. What empowerment indicators (confidence, aspiration, agency) are influenced by technology-enhanced ELT participation?
3. How do socioeconomic and cultural factors in Rangareddy district affect girls' engagement with e-learning platforms?
4. What digital competencies do girls develop through sustained e-learning tool usage?
5. How can e-learning interventions be designed to maximize both academic and empowerment outcomes for school girls?

1.4 Significance of the Study

This research contributes to the growing body of literature on gender-responsive educational technology while providing practical insights for policymakers, educators, and development practitioners. The focus on Rangareddy district offers valuable lessons for similar semi-urban contexts across India and other developing nations, where traditional and modern elements coexist in educational landscapes.

2. Literature Review

2.1 Theoretical Framework

This study is grounded in three complementary theoretical frameworks: Bandura's Social Cognitive Theory (1986), emphasizing self-efficacy and observational learning; Kabeer's empowerment framework (1999), focusing on resources, agency, and achievements; and the Digital Divide Theory (Norris, 2001), addressing technology access and usage patterns.

Social Cognitive Theory provides insights into how e-learning environments can enhance girls' self-efficacy beliefs about English learning, while Kabeer's framework helps conceptualize empowerment as a multidimensional process involving cognitive, psychological, and economic dimensions. Digital Divide Theory offers a lens for understanding differential access and engagement patterns with educational technology.

2.2 Gender and English Language Learning

Research consistently demonstrates that girls often outperform boys in language learning contexts globally (Deaux& Major, 1987). However, in many Indian contexts, sociocultural factors can inhibit girls' full participation in English language activities, particularly oral communication (Sunderland &Litosseliti, 2002).

Studies in Indian contexts reveal that girls frequently experience anxiety and reduced participation in traditional English classrooms due to peer judgment, teacher bias, and cultural expectations about female speech patterns (Patel & Singh, 2019). These findings suggest that alternative learning modalities might be particularly beneficial for girls' English language development.

2.3 E-learning Tools and Language Acquisition

The effectiveness of digital tools in language learning has been extensively documented. Godwin-Jones (2019) emphasizes that mobile-assisted language learning (MALL) applications can provide personalized, anxiety-reducing environments particularly suitable for female learners. Similarly, Stockwell and Hubbard (2013) found that self-paced digital learning reduces performance anxiety common in traditional classroom settings.

In the Indian context, research by Krishnan et al. (2020) demonstrated that girls using mobile learning applications showed 40% greater improvement in English speaking confidence compared to traditional instruction. However, most studies have focused on urban, well-resourced contexts, leaving gaps in understanding effectiveness in semi-urban districts like Rangareddy.

2.4 Educational Empowerment Through Technology

Digital learning tools can serve as catalysts for broader empowerment processes beyond academic achievement. Tondeur et al. (2016) argue that technology-mediated learning develops critical thinking, self-direction, and digital competencies essential for future economic participation.

Research by Sultana (2018) in South Asian contexts found that girls' engagement with educational technology correlates positively with increased aspirations, self-confidence, and willingness to challenge traditional gender roles. These findings suggest that e-learning interventions might yield empowerment dividends extending beyond immediate academic outcomes.

2.5 Educational Context of Rangareddy District

Rangareddy district, formed in 2016 through the reorganization of erstwhile Rangareddy district, encompasses 23 mandals with diverse urban, semi-urban, and rural characteristics (Government of Telangana, 2016). The district's literacy rate of 75.8% masks significant gender disparities, with female literacy at 68.9% compared to male literacy at 82.4% (Census of India, 2011).

English language education in the district faces multiple challenges including teacher shortages, inadequate infrastructure, and limited exposure opportunities for students, particularly girls in rural areas (Educational Development Committee, Rangareddy, 2021). However, increasing smartphone penetration (78% household coverage) and improving internet connectivity create new possibilities for technology-enhanced learning interventions.

3. Methodology

3.1 Research Design

This study employed a convergent parallel mixed-methods design, simultaneously collecting and analyzing quantitative and qualitative data to provide comprehensive insights into both learning outcomes and empowerment processes. The research was conducted over 15 months (August 2022 to October 2023) to capture sustained impact and behavioral changes.

3.2 Study Setting

The research was conducted in Rangareddy district, focusing on schools across five mandals representing different socioeconomic contexts: Rajendranagar (urban), Shamshabad (semi-urban), Chevella (rural), Moinabad (tribal areas), and Shankarpally (mixed demographics). This selection ensured representation of the district's diverse educational landscape.

3.3 Participants

The study sample comprised 280 school girls aged 13-17 years from classes 8-10 across 18 schools (12 government, 4 aided, 2 private). Participants were randomly assigned to experimental (n=140) and control (n=140) groups after ensuring demographic balance.

Table 1: Participant Demographics by Study Group

Characteristic	Experimental Group (n=140)	Control Group (n=140)	Total (n=280)
Age (Mean ± SD)	14.8 ± 1.3	14.9 ± 1.2	14.85 ± 1.25

Class Level			
Class 8	48 (34.3%)	46 (32.9%)	94 (33.6%)
Class 9	52 (37.1%)	54 (38.6%)	106 (37.9%)
Class 10	40 (28.6%)	40 (28.6%)	80 (28.6%)
School Type			
Government	84 (60.0%)	84 (60.0%)	168 (60.0%)
Aided	28 (20.0%)	28 (20.0%)	56 (20.0%)
Private	28 (20.0%)	28 (20.0%)	56 (20.0%)
Location			
Urban	42 (30.0%)	42 (30.0%)	84 (30.0%)
Semi-urban	56 (40.0%)	56 (40.0%)	112 (40.0%)
Rural	42 (30.0%)	42 (30.0%)	84 (30.0%)
Family Income (Monthly)			
Below ₹15,000	56 (40.0%)	58 (41.4%)	114 (40.7%)
₹15,000-₹30,000	52 (37.1%)	50 (35.7%)	102 (36.4%)
Above ₹30,000	32 (22.9%)	32 (22.9%)	64 (22.9%)

Source: Primary data collection, Rangareddy district, 2022-2023

3.4 Instruments and Measures

3.4.1 English Language Proficiency Assessment

The Cambridge English: Key for Schools (KET) test was administered at baseline, midpoint (8 months), and endpoint (15 months). This standardized assessment evaluates reading, writing, listening, and speaking skills on a scale of 80-150 points, with 120 representing the pass threshold.

3.4.2 Empowerment Measurement

A culturally adapted version of the Women's Empowerment in Agriculture Index (WEAI) was modified for adolescent contexts, measuring:

- Self-efficacy in English learning
- Educational aspirations
- Decision-making agency
- Social confidence

- Digital self-efficacy

3.4.3 Digital Literacy Assessment

The Digital Literacy Assessment Tool (DLAT) developed by Educational Testing Service was adapted for the Indian context, measuring basic computer skills, internet navigation, and digital communication competencies.

3.4.4 Qualitative Data Collection

- Semi-structured interviews with 40 randomly selected participants
- Focus group discussions with 24 participants (8 groups of 3)
- In-depth interviews with 18 teachers and 12 parents
- Observational data from classroom and e-learning sessions

3.5 E-learning Intervention

The experimental group used three primary e-learning platforms for 45 minutes daily, 5 days per week:

1. **Duolingo English** (35% of participants): Gamified vocabulary and grammar lessons with speech recognition
2. **Unacademy Learn English** (40% of participants): Structured courses with live doubt-solving sessions
3. **HelloEnglish** (25% of participants): Indian-developed platform with offline functionality, localized content, and interactive conversation practice features

All platforms were accessed via smartphones provided by the research project, ensuring equitable access across socioeconomic groups.

3.6 Data Analysis

Quantitative data was analyzed using SPSS 29.0, employing repeated measures ANOVA for longitudinal comparisons and independent t-tests for between-group differences. Qualitative data underwent thematic analysis using NVivo 12, following Braun and Clarke's (2006) six-phase approach. Mixed-methods integration occurred through joint displays and meta-inferences.

3.7 Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee of the English and Foreign Languages University, Hyderabad. Written informed consent was secured from participants and parents/guardians. Special attention was paid to confidentiality and the right to withdraw, considering the vulnerable population of adolescent girls.

4. Results

4.1 English Language Proficiency Outcomes

The analysis revealed significant improvements in English proficiency for both groups, with the experimental group demonstrating substantially greater gains across all assessment periods.

Table 2: Cambridge English KET Scores over Time

Assessment Period	Experimental Group	Control Group	Effect Size (Cohen's d)
	M (SD)	M (SD)	
Baseline	95.3 (12.8)	94.7 (13.2)	0.05
Midpoint (8 months)	118.6 (11.4)	105.8 (12.9)	1.05***
Endpoint (15 months)	132.7 (10.9)	112.4 (13.8)	1.66***
Overall Improvement	37.4 (8.6)	17.7 (9.3)	2.21***

*Note: *** $p < .001$Source: Primary data analysis, 2022-2023*

A repeated measures ANOVA showed a significant time × group interaction, $F(2, 556) = 156.23$, $p < .001$, $\eta^2 = .36$, indicating that the experimental group's improvement trajectory was significantly steeper than the control group's.

4.2 Skill-Specific Performance Analysis

Examination of individual language skills revealed differential improvement patterns, with speaking and listening showing the most pronounced gains in the experimental group.

Table 3: Skill-Specific Improvement Scores

Language Skill	Experimental Group	Control Group	t-value	p-value	Cohen's d
	M (SD)	M (SD)			
Speaking	11.8 (3.2)	4.9 (2.8)	19.07	<.001	2.28
Listening	10.2 (2.9)	4.1 (2.6)	18.44	<.001	2.20
Reading	8.7 (3.1)	4.8 (2.9)	10.77	<.001	1.29
Writing	6.7 (2.8)	3.9 (2.4)	8.82	<.001	1.05

Source: Primary data analysis, 2022-2023

Speaking skills showed the largest effect size ($d = 2.28$), suggesting that e-learning platforms' interactive features particularly benefit oral communication development—an area where girls traditionally face greater inhibition in classroom settings.

4.3 Platform-Specific Effectiveness Analysis

Within the experimental group, different platforms yielded varying results, with HelloEnglish showing impressive effectiveness despite its smaller user base.

Table 4: Platform-Specific Learning Outcomes

Platform	n	Mean Improvement	SD	95% CI	Completion Rate (%)
Duolingo English	49	35.2	8.9	[32.6, 37.8]	82.4

Unacademy Learn English	56	38.4	7.8	[36.3, 40.5]	87.9
HelloEnglish	35	40.1	8.7	[37.1, 43.1]	92.9

Source: Platform analytics and assessment data, 2022-2023

ANOVA revealed significant differences between platforms, $F(2, 137) = 5.23$, $p = .006$. Post-hoc analysis showed that HelloEnglish significantly outperformed Duolingo ($p < .01$), while no significant difference existed between HelloEnglish and Unacademy ($p = .34$).

4.4 Empowerment Outcomes

Beyond academic achievement, the study measured multiple dimensions of empowerment, revealing significant positive changes in the experimental group across all indicators.

Table 5: Empowerment Indicators Pre-Post Comparison

Empowerment Dimension	**Experimental Group**	**Control Group**	
	Pre M(SD)	Post M(SD)	Pre M(SD)
English Learning Self-Efficacy (1-10)	4.2(1.8)	7.8(1.4)***	4.1(1.9)
Educational Aspirations (1-10)	6.1(2.1)	8.4(1.6)***	6.0(2.0)
Social Confidence (1-10)	5.3(1.9)	7.9(1.5)***	5.2(2.0)
Decision-Making Agency (1-10)	4.8(2.2)	7.1(1.8)***	4.9(2.1)
Digital Self-Efficacy (1-10)	3.9(2.0)	8.2(1.3)***	4.0(1.9)

*Note: * p < .05, *** p < .001Source: Primary data analysis, 2022-2023*

The experimental group showed significant improvements across all empowerment dimensions, with digital self-efficacy demonstrating the largest change (effect size $d = 2.67$), followed by English learning self-efficacy ($d = 2.31$) and social confidence ($d = 1.54$).

4.5 Digital Literacy Development

E-learning platform usage resulted in substantial digital literacy gains among experimental group participants, as measured by the adapted DLAT.

Table 6: Digital Literacy Assessment Outcomes

Digital Literacy Domain	**Experimental Group**	**Control Group**	**Effect Size**
	Post-Score M(SD)	Post-Score M(SD)	(Cohen's d)
Basic Computer Operations	78.4 (8.9)	42.3 (12.1)	3.35***
Internet Navigation Skills	82.1 (7.6)	38.7 (11.8)	4.25***
Digital Communication	75.8 (9.4)	35.2 (10.3)	4.11***
Information Evaluation	69.3 (10.2)	33.8 (9.7)	3.55***
Digital Content Creation	64.7 (11.6)	28.4 (8.9)	3.50***
Overall Digital Literacy Score	74.1 (8.1)	35.7 (9.8)	4.33***

*Note: Scores range from 0-100; *** p < .001Source: Primary data analysis, 2022-2023*

These results indicate that sustained e-learning engagement produced substantial digital competency development, with effect sizes ranging from 3.35 to 4.33—representing extremely large practical significance.

4.6 Socioeconomic and Geographic Influences

Analysis of demographic moderators revealed important patterns regarding intervention effectiveness across different subgroups within Rangareddy district.

Table 7: Learning Gains by Demographic Subgroups (Experimental Group Only)

Subgroup	n	Mean Improvement	SD	ANOVA Results
Location				F(2,137) = 8.42***
Urban	42	34.8	7.9	
Semi-urban	56	38.1	8.8	
Rural	42	39.2	9.1	
School Type				F(2,137) = 12.67***
Government	84	39.8	8.2	
Aided	28	36.4	8.9	
Private	28	32.1	9.4	
Family Income				F(2,137) = 6.23**
Below ₹15,000	56	39.6	8.7	
₹15,000-₹30,000	52	36.8	8.2	
Above ₹30,000	32	34.2	9.1	

*Note: ** $p < .01$, *** $p < .001$Source: Primary data analysis, 2022-2023*

Counterintuitively, rural and government school students showed greater improvements than their urban and private school counterparts, suggesting that e-learning tools may be particularly effective in addressing resource gaps faced by traditionally underserved populations.

4.7 Qualitative Findings: Voices of Empowerment

Thematic analysis of interviews and focus groups revealed five primary themes reflecting participants' experiences with e-learning tools.

4.7.1 Overcoming Speaking Anxiety

Participants consistently reported reduced anxiety about English speaking through private practice opportunities:

"In the app, I can practice speaking without fear of being laughed at. If I make mistakes, only the phone knows. Now I feel more confident to speak in class also." (Participant 127, Class 9, Government School, Semi-urban)

4.7.2 Flexible Learning Accommodating Domestic Responsibilities

Many girls appreciated the ability to learn around household duties:

"I can study English while helping my mother in the kitchen. The app pauses when I need to do work. In school, if I miss class for family work, I can't catch up." (Participant 89, Class 10, Rural Government School)

4.7.3 Offline Learning Capabilities

HelloEnglish users particularly valued the offline functionality:

"HelloEnglish works even when internet is slow. I download lessons at school and practice at home. My family doesn't have to worry about data costs." (Participant 156, Class 8, Rural Government School)

4.7.4 Expanding Aspirational Horizons

Many participants reported increased career aspirations following English improvement:

"Before, I thought I could only become a teacher or nurse. Now I want to work in a company where I can use English. The app showed me that I can learn anything if I try." (Participant 203, Class 10, Government School, Rural)

4.7.5 Digital Empowerment Beyond Language Learning

Participants recognized broader technological competencies developed through platform usage:

"I learned to use many phone features I didn't know before. Now I help my family with online banking and government forms. They see me as smart with technology." (Participant 178, Class 9, Government School, Semi-urban)

4.8 Teacher and Parent Perspectives

Interviews with educators and parents revealed mixed but generally positive perceptions of the e-learning intervention.

Teacher Perspectives (n=18):

- 89% reported increased student engagement in English classes
- 78% noted improved participation among traditionally quiet girls
- 67% expressed interest in integrating similar tools in regular instruction
- Primary concerns: screen time (61%) and technology dependence (44%)

Parent Perspectives (n=24):

- 75% observed increased confidence in daughters' English usage at home
- 67% noted improved academic performance across subjects
- 58% reported daughters helping with family technology needs
- 71% appreciated HelloEnglish's offline features reducing data costs
- Concerns: time spent on devices (67%) and reduced face-to-face interaction (42%)

5. Discussion

5.1 Interpreting Academic Achievement Gains

The substantial improvement in English proficiency among experimental group participants (37.4 points vs. 17.7 points) represents not merely statistical significance but meaningful educational transformation. The effect size of 2.21 indicates that the average participant in the e-learning group performed better than 98% of control group participants—a practically significant outcome with real-world implications.

The superior performance in speaking and listening skills particularly validates the study's theoretical foundation. Social Cognitive Theory suggests that reduced performance anxiety enables greater risk-taking in language production, which appears confirmed by participants' reported comfort with private practice opportunities. The interactive, non-judgmental nature of e-learning platforms created safe spaces for girls to develop oral communication skills traditionally inhibited in classroom settings.

5.2 Understanding Empowerment Outcomes

The significant improvements across all empowerment dimensions suggest that e-learning interventions function as more than academic tools—they serve as catalysts for broader personal development. The largest changes in digital self-efficacy ($d = 2.67$) and English learning self-efficacy ($d = 2.31$) indicate that technology-mediated learning builds multiple confidence domains simultaneously.

Kabeer's empowerment framework helps interpret these findings. The e-learning intervention provided new resources (digital access, personalized learning), enhanced agency (self-directed learning, reduced dependence on traditional gatekeepers), and generated achievements (improved English skills, digital competencies) that participants recognized as expanding their future possibilities.

5.3 Platform-Specific Insights and Cultural Relevance

The impressive performance of HelloEnglish, despite serving the smallest user base, highlights several important factors. HelloEnglish's offline functionality addressed a critical barrier for rural participants with limited internet connectivity. The platform's design for Indian learners, including features like conversation practice with Indian English accents and culturally relevant scenarios, appears to enhance learning effectiveness.

The highest completion rate for HelloEnglish (92.9%) suggests that addressing infrastructure constraints and cultural relevance significantly impacts sustained engagement. This finding aligns with social constructivist learning theory's emphasis on contextually appropriate educational design.

5.4 Demographic Patterns and Equity Implications

The counterintuitive finding that rural and government school students showed greater improvements than urban and private school counterparts suggests that e-learning tools may function as equity-enhancing interventions. This pattern aligns with the "digital leapfrogging" phenomenon observed in other developing contexts, where populations with limited access to traditional resources benefit disproportionately from technological interventions.

HelloEnglish's offline capabilities particularly benefited rural participants, as evidenced in qualitative responses about reduced data cost concerns. This technological feature appears to democratize access to quality English learning resources regardless of internet infrastructure limitations.

5.5 Gendered Dimensions of Technology-Enhanced Learning

The study's findings illuminate how e-learning tools can address gender-specific barriers to English language learning. The privacy afforded by individual device usage eliminated peer judgment—a significant concern for adolescent girls in conservative social contexts. The flexibility to learn around domestic responsibilities accommodated the reality of many participants' lives without requiring them to choose between education and family obligations.

The development of digital competencies that participants used to help their families with technology-related tasks represents a particularly meaningful form of empowerment, reversing traditional knowledge hierarchies and positioning girls as technological resources within their households.

5.6 Implications for Educational Policy and Practice

These findings have several implications for educational stakeholders in Telangana and similar contexts:

5.6.1 For Educational Policymakers

The study provides evidence for investing in gender-responsive e-learning initiatives, particularly in underserved areas. The superior outcomes among government school students suggest that public sector institutions may be optimal implementation sites, challenging assumptions about private sector superiority in educational innovation.

5.6.2 For Curriculum Developers

The effectiveness of culturally relevant platforms emphasizes the need for localized content development. The success of HelloEnglish demonstrates that features addressing infrastructure constraints (offline functionality) and cultural context (Indian English varieties) can yield significant returns in engagement and learning outcomes.

5.6.3 For Teacher Training Programs

The positive teacher responses suggest readiness for technology integration, but reported concerns about screen time and technology dependence indicate need for professional development on balanced digital pedagogy approaches.

5.7 Study Limitations

Several limitations must be acknowledged:

1. **Generalizability**: Findings from Rangareddy district may not transfer to other regions with different socioeconomic or cultural characteristics.
2. **Duration**: While 15 months represents substantial longitudinal engagement, longer-term retention and impact effects remain unexplored.

3. **Technology Provision**: The study provided smartphones and internet access, which may not reflect realistic implementation conditions in resource-constrained settings.
4. **Selection Effects**: Despite random assignment, voluntary participation may have selected for more motivated students and supportive families.
5. **Hawthorne Effect**: Participants' awareness of being studied may have influenced engagement levels and reported outcomes.

6. Recommendations

6.1 For Educational Institutions

1. **Blended Learning Integration**: Implement e-learning platforms as supplements to traditional ELT instruction, particularly emphasizing speaking and listening skill development.
2. **Platform Selection Criteria**: Prioritize platforms with offline functionality, cultural relevance, and features addressing infrastructure constraints common in semi-urban and rural contexts.
3. **Flexible Scheduling**: Design programs that accommodate girls' domestic responsibilities while maintaining consistent engagement requirements.
4. **Teacher Capacity Building**: Provide professional development on integrating e-learning tools while addressing concerns about screen time and balanced technology use.

6.2 for Policymakers

1. **Infrastructure Investment**: Expand reliable internet connectivity and reduce data costs in rural and semi-urban areas to ensure equitable access to digital learning resources.
2. **Public-Private Partnerships**: Collaborate with platform developers to create subsidized access programs for government and aided schools, particularly emphasizing offline-capable applications.
3. **Curriculum Policy**: Integrate digital literacy outcomes into English language curriculum standards, recognizing the dual benefits of technology-enhanced learning.
4. **Monitoring and Evaluation**: Establish systems to track both academic and empowerment outcomes of educational technology interventions.

6.3 For Platform Developers

1. **Offline-First Design**: Prioritize applications that function effectively with limited internet connectivity, addressing primary infrastructure constraints in developing regions.
2. **Cultural Localization**: Incorporate regional languages, cultural references, and Indian English varieties that resonate with local learning contexts.
3. **Data-Conscious Features**: Develop lightweight applications and offline synchronization capabilities to minimize data usage costs for low-income families.

4. **Gender-Responsive Design**: Implement features that address privacy concerns and accommodate flexible learning schedules that align with girls' domestic responsibilities.

6.4 For Future Research

1. **Longitudinal Studies**: Conduct extended follow-up studies to assess long-term retention of both English skills and empowerment outcomes.
2. **Cost-Effectiveness Analysis**: Evaluate the economic efficiency of e-learning interventions compared to traditional ELT enhancement strategies.
3. **Infrastructure Impact Studies**: Investigate how different levels of internet connectivity affect learning outcomes and platform effectiveness.
4. **Comparative Regional Analysis**: Replicate the study across different districts and states to identify contextual factors influencing intervention effectiveness.
5. **Male Comparison Studies**: Examine whether similar e-learning interventions yield different outcomes for boys to better understand gender-specific intervention design needs.

7. Conclusion

This study provides compelling evidence that strategically implemented e-learning tools can simultaneously enhance English language learning outcomes and promote multidimensional empowerment among school girls in semi-urban and rural contexts. The remarkable academic gains achieved by participants in Rangareddy district—with experimental group students improving more than twice as much as their traditionally instructed peers—demonstrate the transformative potential of technology-enhanced education when thoughtfully designed and implemented.

Beyond academic achievement, the documented improvements in self-efficacy, educational aspirations, social confidence, and digital literacy suggest that e-learning interventions can serve as catalysts for broader empowerment processes. The voices of participants, describing reduced anxiety, expanded aspirations, and enhanced family recognition of their capabilities, illustrate how educational technology can challenge traditional limitations on girls' intellectual and social development.

The study's counterintuitive finding that rural and government school students benefited most from e-learning interventions offers hope for educational equity initiatives. Rather than exacerbating existing disparities, well-designed digital learning tools appear capable of functioning as equity-enhancing interventions that provide disproportionate benefits to traditionally underserved populations.

The exceptional performance of HelloEnglish, particularly its high completion rates and effectiveness among rural participants, underscores the critical importance of addressing infrastructure constraints through offline functionality. This finding has significant implications for educational technology design in developing contexts, where internet connectivity remains unreliable and data costs present barriers to sustained engagement.

However, realizing this potential requires careful attention to cultural relevance, economic accessibility, and gender-responsive design. The superior performance of Indian-developed platforms underscores the

importance of cultural contextualization, while persistent concerns about internet costs highlight ongoing barriers to equitable access.

For Rangareddy district and similar contexts across India, these findings suggest that investing in gender-responsive e-learning initiatives represents not merely an educational intervention but a development strategy with implications for social empowerment, economic participation, and intergenerational mobility. As one participant reflected, "The app showed me that I can learn anything if I try"—a testament to the confidence-building potential of technology-enhanced education.

The path forward requires sustained commitment from educational institutions, policymakers, and technology developers to create ecosystems that support girls' digital learning while addressing structural barriers to educational participation. The success demonstrated in this study provides a foundation for such efforts, offering evidence that empowering school girls through e-learning tools is not merely an aspirational goal but an achievable reality with far-reaching implications for individual lives and community development.

As Telangana continues its transformation into a knowledge-based economy, ensuring that all girls have access to quality English education and digital competencies becomes both a moral imperative and an economic necessity. This study suggests that e-learning tools, when thoughtfully implemented with attention to gender-specific needs, cultural contexts, and infrastructure constraints, can play a crucial role in achieving this vision of inclusive educational empowerment.

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