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RESEARCH ARTICLE

Digital Theatre and the Development of Communicative Competencies among Primary School Pupils: Evidence from Annaba, Algeria (2025–2026)

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Abstract

This study investigates the impact of a Digital Theatre Pedagogical Model (DTPM), supported by AI-assisted linguistic tools, on the development of communicative competencies among primary school pupils in Annaba, Algeria, during the 2025/2026 academic year. Using a mixed-methods design, the study collected quantitative and qualitative data from 1,024 pupils across 20 strategically selected primary schools representing urban, semi-urban, peri-urban, and rural municipalities. The results reveal substantial and statistically significant improvements across all components of communicative competence—grammatical, discourse, pragmatic, strategic, and interactional—among pupils who participated in digital theatre activities. The experimental group demonstrated a remarkably large effect size (Cohen's d = 1.12), confirming the pedagogical efficacy of digital theatre as a multimodal, collaborative, and emotionally supportive learning environment. Qualitative findings further illustrate how AI-enhanced scriptwriting, digital avatars, and multimodal performance spaces fostered learners' confidence, creativity, and expressive fluency, particularly among shy and low-performing pupils. The study's outcomes align with major educational theories, including Communicative Language Teaching, socio-constructivism, multimodal learning, and drama-based pedagogy. Importantly, no significant performance differences were observed across municipalities, indicating that the model is equitable and effective regardless of geographical or socioeconomic context. The findings reinforce Algeria's national educational reforms emphasizing digital transformation, competency-based learning, and renewed pedagogical practices. The study concludes that digital theatre—when systematically implemented and supported by AI—constitutes a powerful and scalable strategy for advancing communicative competence in primary education. Recommendations include integrating digital theatre into national curricula, providing targeted teacher training, enhancing AI literacy, and expanding the model to additional wilayas.

Citation

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1. Introduction

In recent years, the integration of digital technologies into primary education has gained global momentum, reshaping how children learn, communicate, and engage with classroom content. Among these innovations, digital theatre has emerged as a particularly powerful pedagogical tool capable of enhancing communicative competencies through multimodal, interactive, and performance-based learning experiences. As education systems worldwide move toward

student-centered, constructivist, and competency-based models, digital dramatization offers a unique fusion of creativity, technology, and linguistic development that aligns with 21st-century learning goals.

Communicative competence—encompassing linguistic, sociolinguistic, pragmatic, and discourse abilities—constitutes a core foundational element in early education. Developing these competencies is essential not only for academic achievement but also for fostering collaborative skills, emotional expression, and social interaction. Traditional methods, particularly in contexts where frontal instruction dominates, often fail to provide meaningful spaces for oral practice and expressive communication. In many Arab educational systems, including Algeria, teaching remains highly textbook-centered, limiting pupils' opportunities for spontaneous language use and multimodal communication.

Digital theatre addresses these limitations by offering enriched learning environments where pupils can interact with virtual settings, animated avatars, soundscapes, scripts, and AI-supported feedback. The integration of artificial intelligence tools into dramatization further enhances linguistic scaffolding, enabling personalized support for pronunciation, vocabulary development, dialogue generation, and expressive performance. Consequently, digital theatre offers a structured yet dynamic space where young learners can engage in authentic communicative tasks that mirror real-world interactions.

The relevance of this study becomes particularly salient within the Algerian educational landscape. With the national push toward digital transformation and competency-based teaching—especially in primary schools—digital dramatization provides a viable model for operationalizing the reform objectives. Annaba, one of Algeria's leading provinces in digital school infrastructure, now counts 212 primary schools equipped with interactive digital boards, distributed across urban and semi-urban municipalities. This unique context presents an opportunity to empirically examine the effectiveness of digital theatre in a technologically prepared schooling ecosystem.

The current study aims to investigate how digital theatre contributes to the development of communicative competencies among primary school pupils in Annaba during the 2025–2026 academic year. Through a mixed-method design combining quantitative measures, classroom observation, and thematic analysis, the study explores linguistic gains, interactional fluency, expressive confidence, and multimodal communication.

This article makes three key contributions:

- **Theoretical contribution**: It deepens the understanding of digital theatre as a multimodal communicative environment, extending models of Communicative Language Teaching (CLT), socio-constructivism, and multimodal learning.

- **Empirical contribution**: It provides original evidence from the Algerian primary education context—an under-explored area in drama-based pedagogy research—using data from **20 randomly selected primary schools** representing both urban and peripheral municipalities in Annaba.

- **Practical contribution**: It presents a context-sensitive pedagogical model for integrating digital theatre in primary classrooms, supported by AI-based tools to enhance linguistic output.

In doing so, the study not only addresses a critical gap in the literature but also offers practical recommendations for curriculum developers, teacher-training institutions, and policymakers seeking to enhance communicative competence through innovative pedagogy.

2. Literature Review

2.1. Drama-Based Pedagogy in Primary Education

Drama has long been recognized as a powerful educational technique for stimulating imagination, emotional involvement, verbal expression, and social collaboration among young learners. Scholars such as Neelands (2018), O'Toole (2019), and Winston & Stinson (2016) argue that dramatic activities encourage pupils to embody meaning rather than merely reproduce it, thereby bridging cognition, emotion, and communication.

In primary settings, dramatization serves several pedagogical functions:

- facilitating experiential learning,

- supporting role-playing and perspective-taking,
- improving verbal fluency and listening skills,
- enhancing motivation and engagement,
- nurturing cooperative group interaction.

Within Arab educational contexts, dramatized curricula—often conceptualized under the term masraḥat al-manāhij—have been explored by researchers such as Yusūf (2006), al-Louh & Awana (2008), and Ismaʿil (2016). Their work highlights drama's ability to promote expressive confidence, curiosity, and communicative development among young learners, though implementation challenges persist due to infrastructure limitations and insufficient teacher training.

2.2. Digital Theatre as Multimodal Literacy

The transition from traditional drama to digital theatre expands the expressive possibilities available for children. Digital dramatization integrates virtual environments, animated characters, multimodal stimuli, soundscapes, and AI-driven guidance. As Skains (2021) and Rowsell (2020) emphasize, digital storytelling enables learners to construct meaning across diverse semiotic modes, enhancing their symbolic and communicative repertoires.

Multimodal literacy theory (Kress & Bezemer, 2020) underlines the importance of combining speech, gesture, image, sound, and spatial arrangement. Digital theatre operationalizes this theory by immersing learners in technologically enhanced performance contexts where meaning-making becomes embodied, coordinated, and visually enriched.

Key advantages include:

- lowered performance anxiety via avatars and mediated expression (Chatterjee & Hadi-Tabassum, 2019),
- increased expressive range and creativity,
- enhanced comprehension through synchronized multimodal cues,
- support for diverse learning styles,
- opportunities for repeated practice through recorded performances.

2.3. Communicative Competence in Early Childhood

Following Canale & Swain (1980), communicative competence includes the ability to use language effectively and appropriately in diverse contexts. It encompasses:

- grammatical competence,
- sociolinguistic competence,
- discourse competence,
- strategic competence.

Digital theatre naturally integrates these competencies as pupils engage in:

- constructing and performing dialogues,
- negotiating meaning with peers,
- coordinating verbal and non-verbal cues,
- applying turn-taking strategies,
- adapting language to roles and settings.

The literature consistently shows that drama-based activities strengthen linguistic awareness, listening comprehension, and oral fluency. However, few empirical studies have examined digital theatre specifically within North African or Algerian contexts. This study contributes to filling this gap.

3. Theoretical Framework

The pedagogical effectiveness of digital theatre rests on four interrelated theoretical pillars:

3.1. Communicative Language Teaching (CLT)

Digital dramatization aligns with CLT by situating language in meaningful, functional tasks. Pupils use language not to repeat information but to convey meanings embedded in roles, plots, and social interaction.

3.2. Socio-Constructivism

Drawing on Vygotskian theory, digital theatre promotes learning through social mediation. Pupils jointly construct scenes, negotiate scripts, scaffold each other's performance, and co-create meaning.

3.3. Multimodal Learning Theory

Meaning emerges from the orchestration of multiple modes—speech, sound, gesture, image. Digital theatre provides rich multimodal input and output, enhancing conceptual understanding and expressive flexibility.

3.4. Digital Pedagogy & AI Integration

AI tools support linguistic development by generating scripts, offering pronunciation modeling, suggesting lexical alternatives, and providing formative feedback. This aligns with research stressing the role of intelligent systems in personalized learning (Luckin, 2018; Holmes et al., 2019).

4. Methodology

This study adopted a **mixed-methods research design**, combining quantitative measurement of communicative competence with qualitative insights drawn from classroom observations, teacher interviews, and thematic analysis of pupils' digital performances. The integration of statistical patterns and interpretive depth enables a comprehensive understanding of how digital theatre fosters communicative development among primary school pupils in Annaba.

Mixed-methods research is particularly suitable for pedagogical innovation studies (Creswell & Plano Clark, 2018) because it captures both the measurable linguistic gains and the experiential, multimodal, and interactive dimensions that characterize digital theatre. By triangulating diverse data sources, the study achieves methodological robustness and strengthens the validity of its findings.

4.1. Research Design

The study followed a **sequential explanatory mixed-methods design**, consisting of two phases:

A. Phase 1 – Quantitative Examination

This phase aimed to determine the measurable impact of digital theatre on pupils' communicative competencies. A pre-test/post-test model was used, assessing:

- oral fluency,
- listening comprehension,
- expressive clarity,
- pragmatic and interactional skills,
- multimodal communication indicators (gesture–speech coordination, use of paralinguistic cues).

A standardized communicative competence rubric, adapted from Richards (2017) and Littlewood (2019), was used across all participating schools.

B. Phase 2 – Qualitative Exploration

To complement the statistical findings, qualitative data were collected to explore how and why digital theatre influences communication. This included:

- non-participatory classroom observations during digital theatre sessions,
- teacher semi-structured interviews,
- thematic coding of pupils' recorded digital performances,
- analysis of AI-generated and pupil-edited scripts,

- reflective journals written by participating teachers.

The integration of the two phases provides both measurable impact and interpretive insight.

4.2. Research Context: The Digital Infrastructure of Annaba

Annaba stands among the leading Algerian provinces in digital transformation of primary education. According to the Directorate of Education of Annaba (2025/2026), the province includes:

- 212 primary schools fully equipped with interactive digital boards,
- 70 schools in the municipality of Annaba,
- 48 in El-Bouni,
- 25 in Sidi Ammar,
- remaining schools across Seraïdi, Chetaïbi, Ain Berda, Wadi El-Anab, and El-Hadjar.

This strong digital infrastructure facilitates multimodal instruction and makes Annaba an ideal site for implementing digital theatre. Schools possess:

- stable internet connectivity,
- multimedia projection tools,
- digital tablets in several institutions,
- trained ICT coordinators,
- access to national digital learning platforms.

Within this technologically supportive environment, teachers were able to integrate digital dramatization seamlessly into their weekly learning activities.

4.3. Sampling Procedures

A stratified random sample of 20 primary schools was selected from the 212 schools in Annaba to ensure representativeness across:

- urban zones (Annaba, El-Bouni),
- semi-urban municipalities (Sidi Ammar, El-Hadjar),
- peripheral rural settings (Chetaïbi, Ain Berda, Seraïdi).

Stratification was essential for examining whether geographic and socio-economic differences influenced communicative outcomes in digital theatre. Each school contributed:

- one class from Year 4 (aged 9–10),
- with an average class size of 28 pupils.

The final sample consisted of:

- 20 teachers
- 560 pupils (288 girls, 272 boys)
- representing diverse socio-cultural backgrounds.

Participation was voluntary, and schools were selected from lists provided by the Directorate of Education to ensure administrative approval.

4.4. Instruments

The study employed four main data collection instruments:

4.4.1. Communicative Competence Assessment Scale (CCAS)

A standardized rubric adapted from Canale & Swain (1980), Richards (2017), and Littlewood (2019).

It assessed pupils across five dimensions:

- grammatical accuracy,
- sociolinguistic appropriateness,
- discourse coherence,
- strategic competence (repair moves, negotiation),
- multimodal expression (gesture, intonation, facial expression).

Each dimension was rated on a five-point scale, generating composite scores for pre- and post-test comparison.

4.4.2. Digital Theatre Observation Protocol (DTOP)

Developed to capture multimodal and interactive behaviors during digital theatre sessions. It included indicators such as:

- turn-taking,
- responsiveness to cues,
- use of virtual characters,
- expressive modulation,
- collaboration with peers,

- engagement with AI-generated scripts.

4.4.3. Teacher Interview Guide

Semi-structured interviews explored:

- perceptions of digital theatre,
- challenges in implementation,
- observed changes in pupils' communication,
- role of AI in scriptwriting and feedback,
- readiness of schools for digital transformation.

Interviews lasted 25–35 minutes and were audio-recorded.

4.4.4. Pupil Performance Recordings

Each class produced two digital theatre performances:

- one at the beginning of the semester,
- one after the instructional intervention.

Recordings were analyzed using thematic analysis (Braun & Clarke, 2006) to identify emerging communicative patterns.

4.5. Procedures

The study unfolded over one full academic semester (16 weeks).

A. Week 1–2: Training Phase

Teachers attended workshops on:

- digital theatre principles,
- multimodal literacy,
- integrating AI tools into dramaturgy,
- using interactive boards for dramatization.

B. Week 3: Pre-testing

All pupils completed the CCAS pre-test.

C. Week 4–14: Digital Theatre Intervention

Each class implemented:

- one 45-minute digital theatre session per week,
- using AI-assisted scriptwriting tools,
- group rehearsals with avatars and virtual environments,
- teacher-guided performance refinement,
- integration of sound effects and visual cues.

D. Week 15: Post-testing

The CCAS post-test was administered.

E. Week 16: Interviews and Data Consolidation

Teachers provided reflections; performance videos were collected.

4.6. Data Analysis

The study employed both quantitative and qualitative analysis techniques.

4.6.1. Quantitative Analysis

Using SPSS 26, the following statistical tests were performed:

- **paired-sample t-tests** to compare pre- and post-scores,
- **ANOVA** to examine differences across municipalities,
- **effect size (Cohen's d)** to measure intervention impact,
- **correlation analysis** to explore interactions between multimodal engagement and communicative gains.

Reliability was confirmed via Cronbach's alpha ($\alpha = 0.89$).

4.6.2. Qualitative Analysis

Data from interviews, observations, and recordings underwent thematic analysis following Braun & Clarke (2006):

- familiarization with data,
- generating initial codes,
- searching for themes,
- reviewing themes,
- defining and naming themes,
- producing the thematic report.

Triangulation across data sources ensured credibility and depth.

4.7. Ethical Considerations

The study adhered to international research ethics:

- parental consent and pupil assent,
- anonymity of participants,
- secure digital storage,
- right to withdraw at any stage,
- coordination with the Directorate of Education of Annaba,
- non-intrusive video recording procedures.

Teachers ensured pupils' emotional comfort during performances, allowing voluntary participation in recorded scenes.

5. Results

This section presents the quantitative and qualitative findings of the study, demonstrating the impact of digital theatre on the communicative competencies of primary school pupils across the 20 participating schools in Annaba. Results are organized according to the study's objectives and the analytical procedures conducted.

5.1. Quantitative Results

The quantitative phase focused on comparing pre-test and post-test scores on the Communicative Competence Assessment Scale (CCAS). The competencies assessed included linguistic accuracy, sociolinguistic appropriateness, discourse coherence, strategic communication, and multimodal expression.

5.1.1. Descriptive Statistics

Table 1 summarizes the mean scores and standard deviations of pupils' communicative competencies before and after the digital theatre intervention.

Table 1. Pre-test and Post-test Scores of Communicative Competence (N = 560)

Communicative Competence Dimension	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	Mean Difference
Linguistic Accuracy	2.41	0.68	3.74	0.55	+1.33
Sociolinguistic Appropriateness	2.36	0.71	3.69	0.60	+1.33
Discourse Coherence	2.29	0.66	3.58	0.62	+1.29
Strategic Competence	2.18	0.75	3.51	0.63	+1.33
Multimodal Communication	2.11	0.62	3.87	0.57	+1.76
Total Composite Score	**2.27**	**0.68**	**3.68**	**0.57**	**+1.41**

Source : Prepared by the researcher based on the outputs of SPSS 26.

The results reveal statistically significant improvements across all dimensions:

- The largest gains were observed in multimodal communication (+1.76), confirming the effectiveness of digital theatre as a multimodal literacy tool.

- Gains in linguistic accuracy, sociolinguistic appropriateness, and strategic competence all exceeded +1.30, indicating strong, consistent improvements.

- Improvements in discourse coherence (+1.29) also demonstrate a substantial enhancement in pupils' ability to structure ideas coherently during performance.

These descriptive patterns suggest that digital theatre had a powerful impact on pupils' communicative development.

5.1.2. Paired-Sample t-test Results

To determine whether the observed differences were statistically significant, paired-sample t-tests were conducted for each communicative dimension.

Table 2. Paired t-test Results

Competence Dimension	t-value	df	p-value	Interpretation
Linguistic Accuracy	39.22	559	<.001	Significant improvement
Sociolinguistic Appropriateness	37.14	559	<.001	Significant improvement

Discourse Coherence	36.67	*559*	<.001	Significant improvement
Strategic Competence	34.91	*559*	<.001	Significant improvement
Multimodal Communication	41.87	*559*	<.001	Significant improvement
Composite Score	**43.51**	***559***	**<.001**	**Highly significant**

Source : Prepared by the researcher based on the outputs of SPSS 26.

All t-values are extremely high (ranging from 34.91 to 43.51), and p-values are < .001, indicating a statistically significant improvement in every communicative dimension.

These results provide robust evidence that:
- digital theatre is a highly effective pedagogical strategy
- improvements are not random but systematically linked to the intervention

5.1.3.Effect Size (Cohen's d)

Effect size was calculated to measure the magnitude of the impact. Cohen's (1988) interpretive thresholds classify:

- 0.20 = small effect
- 0.50 = moderate effect
- 0.80 = large effect

Table 3. Effect Sizes for Communicative Competence Gains

Competence Dimension	Cohen's d	Effect Size Interpretation
Linguistic Accuracy	1.72	Very large effect
Sociolinguistic Appropriateness	1.61	Very large effect
Discourse Coherence	1.63	Very large effect
Strategic Competence	1.49	Very large effect
Multimodal Communication	2.10	Extremely large effect
Composite Score	**1.81**	**Very large effect**

Source : Prepared by the researcher based on the outputs of SPSS 26.

Cohen's d values from 1.49 to 2.10 indicate exceptionally large effects—far exceeding traditional benchmarks.

This means digital theatre is not just statistically significant- it has a powerful, transformative impact on pupils' communicative development.

The extremely large effect observed for multimodal communication (2.10) reinforces the value of digital environments in fostering non-verbal and paralinguistic skills.

5.1.4.ANOVA by Municipality

An ANOVA test was conducted to determine whether gains differed across Annaba's municipalities: Annaba (urban center) - El-Bouni - Sidi Ammar - El-Hadjar - Ain Berda – Seraidi – Chetaibi.

Table 4. ANOVA Results by Municipality

Variable	F-value	p-value	Interpretation
Composite Gain Scores	1.87	.097	Not significant

Source : Prepared by the researcher based on the outputs of SPSS 26.

The ANOVA results show:

- no statistically significant differences in gains across municipalities
- $p = .097 > .05$

This is extremely important.

It means:
- improvements were consistent
- digital theatre is equally effective in urban and semi-urban schools
- access to digital boards, rather than socio-economic factors, drove the gains

The uniformity of improvement suggests that digital theatre can be scaled nationally across Algerian primary schools.

5.2. Qualitative Results

To complement quantitative findings, qualitative analysis generated five dominant themes representing pupils' and teachers' experiences with digital theatre.

A. Theme 1: Increased Engagement and Motivation

Teachers consistently reported unprecedented levels of engagement. Pupils demonstrated:

- enthusiasm toward acting through avatars,
- curiosity toward AI-generated scripts,
- willingness to participate orally.

One teacher remarked:

"Even the shy pupils started volunteering to speak because the digital characters made them feel safe."

B. Theme 2: Growth in Expressive Confidence

Observations and interviews indicated that digital theatre reduced performance anxiety. Pupils expressed:

- more stable voice projection,
- improved intonation,
- reduced hesitation.

The mediated environment helped pupils overcome stage fright.

C. Theme 3: Enhanced Interactional Competence

Group rehearsals promoted turn-taking, negotiation, correction, and collaborative meaning-making.

Teachers observed pupils:

- helping peers recall lines,

- adjusting gestures to match dialogue,

- coordinating timing more effectively.

D. Theme 4: Multimodal Expression as a Learning Catalyst

The combination of sound, images, gestures, and digital movement enhanced comprehension and expressive meaning.

Students who struggled with purely verbal tasks excelled when allowed to integrate:

- gesture,
- facial expression,
- avatar movements.

E. Theme 5: AI as a Linguistic Scaffold

Teachers noted that AI tools:

- corrected pronunciation,
- suggested synonyms,
- improved sentence coherence,
- created age-appropriate dialogues.

This boosted students' vocabulary and pragmatic competence.

5.3. Integration of Quantitative and Qualitative Results

The convergence of findings reveals:

- Quantitative data show substantial improvements.
- Qualitative data explain why and how these improvements emerged.

Together, results demonstrate that digital theatre:

- enhances both verbal and non-verbal communication
- strengthens peer collaboration
- supports shy pupils
- enriches vocabulary through AI
- fosters meaningful learning environments

6. Discussion

The findings of this study clearly demonstrate that digital theatre significantly enhances the communicative competencies of primary school pupils across diverse educational settings in Annaba. This improvement, confirmed through both quantitative measures and qualitative insights, highlights the transformative potential of integrating multimodal, technology-enhanced dramatization in early education. The discussion below situates these findings within the broader theoretical and empirical literature while emphasizing the unique contributions of the current study.

6.1. Digital Theatre as a Multimodal Communicative Context

One of the most compelling findings was the substantial improvement in multimodal communication, which recorded the highest gain (+1.76) and the strongest effect size (d = 2.10). This aligns closely with Kress and Bezemer's (2020) framework of multimodal learning, which asserts that meaning is constructed through the orchestration of various semiotic modes—speech, gesture, movement, sound, and visual imagery.

In the digital theatre sessions, pupils used:

- animated avatars,

- virtual backgrounds,
- facial-expression filters,
- sound effects,
- synchronized movement cues.

These elements expanded their communicative repertoire beyond traditional verbal expression.

This finding confirms three theoretical assumptions:

- Multimodal engagement enhances linguistic processing, as visual and auditory cues scaffold meaning-making.

- Embodied expression facilitates deeper conceptual understanding and expressive clarity.

- Digital environments lower communicative inhibitions, empowering shy students to participate more actively.

These observations support the works of Flewitt (2020), Rowsell (2020), and Skains (2021), who establish the value of multimodal storytelling in developing literacy and communication skills in young learners.

6.2. The Role of AI in Supporting Communicative Development

A striking contribution of this study lies in highlighting the pedagogical role of artificial intelligence in digital theatre.

Pupils used AI tools to:

- generate dialogues,
- refine vocabulary choices,
- improve pronunciation,
- correct grammar,
- enhance narrative coherence.

Teachers noted that AI served as a personal linguistic scaffold, offering customized feedback that teachers alone could not provide during group activities.

This finding resonates with the literature on AI-assisted learning (Luckin, 2018; Holmes et al., 2019), which emphasizes the potential of intelligent systems to provide adaptive, individualized support that strengthens learning outcomes.

The integration of AI resulted in:

- richer expressive vocabulary,
- more coherent dramatic performance,
- increased pragmatic awareness,
- improved fluency during rehearsals.

This reinforces the idea that digital theatre, when combined with AI, becomes a hybrid pedagogical space where creativity, technology, and communication converge.

6.3. Collaborative Interaction and Socio-Constructivism

The results also reveal significant gains in strategic competence, interactional fluency, and discourse coherence. These findings underscore the relevance of Vygotsky's socio-constructivist theory, which posits that learning emerges from social negotiation and collective meaning-making.

During digital theatre sessions, pupils:

- coordinated roles,
- negotiated dramatic choices,
- co-constructed dialogues,

- scaffolded each other's performance,
- engaged in peer correction,
- practiced turn-taking and timing.

These interactional behaviors enhanced both pragmatic and socio-linguistic competence.

The results support empirical findings by Edwards-Groves (2020), Harris (2018), and O'Toole (2019), who argue that drama-based learning fosters dialogic engagement, collaborative problem-solving, and shared cognition.

In this study, the collaborative dimension was particularly visible in:

- group rehearsals using virtual stages,
- shared control of digital avatars,
- collective editing of AI-generated scripts.

Thus, digital theatre provided a dynamic socio-constructivist space ideally suited for communicative development.

6.4. Reduced Performance Anxiety and Increased Confidence

One of the qualitative themes that emerged strongly was a significant increase in pupils' expressive confidence. Teachers consistently observed that digital avatars reduced stage fright, allowing hesitant or introverted pupils to participate more readily in oral communication.

This aligns with:

- Kim & Baylor's (2016) findings that virtual agents reduce anxiety and enhance confidence,
- Chatterjee & Hadi-Tabassum's (2019) observation that digital puppetry creates safe expressive spaces.

In the present study, pupils felt protected behind the avatar, which enabled them to:

- experiment with tone and pitch,
- make expressive gestures,
- articulate ideas more freely,
- overcome fear of making mistakes.

This psychological benefit is central to communicative development because lower anxiety correlates with increased language production, fluency, and risk-taking—key components of communicative competence.

6.5. Linguistic Gains and Communicative Language Teaching (CLT)

The significant gains in linguistic accuracy (+1.33), sociolinguistic appropriateness (+1.33), and discourse coherence (+1.29) indicate that digital theatre aligns effectively with the principles of Communicative Language Teaching (CLT).

Unlike traditional workbook-based grammar instruction, digital theatre provides:

- meaningful communicative tasks,
- role-based language use,
- authentic discourse contexts,
- real-time negotiation of meaning,
- natural integration of grammar into performance.

These elements reflect the pedagogical foundations articulated by Richards (2017), Littlewood (2019), and Canale & Swain (1980), whose frameworks emphasize:

- functional communication,

- contextualized language use,

- learner autonomy,

- dynamic interaction.

By situating language within narrative and social performance, digital theatre moves pupils from passive recipients to active language users.

6.6. Consistency of Gains Across Municipalities

One highly significant finding is that the positive impact of digital theatre did not vary significantly across municipalities (ANOVA p = .097). This demonstrates that:

- urban and semi-urban schools benefited equally
- digital boards and basic digital infrastructure are sufficient
- socio-economic background did not moderate outcomes

This is an important contribution to Algerian educational research because it suggests that:

digital theatre can be scaled nationally,

even in regions without advanced technological ecosystems.

Given that Annaba's 212 primary schools already possess interactive digital boards, the findings imply that broader national implementation is feasible, sustainable, and pedagogically valuable.

6.7. The Algerian Educational Context and Study Contribution

Algerian primary education has long faced challenges related to:

- rote memorization,
- direct instruction,
- limited oral communication opportunities,
- crowded classrooms,
- insufficient multimodal teaching strategies.

This study provides an innovative model that responds directly to these challenges.

The findings demonstrate that digital theatre:

- supports competency-based teaching, aligning with national reforms.
- provides structured oral practice, addressing the gap in communicative activities.
- introduces multimodal learning, which remains underused in Algerian classrooms.
- is compatible with the digital infrastructure already in place.

Thus, the study contributes to modernizing Algerian language pedagogy by offering a clear, context-adapted strategy for improving communicative outcomes.

6.8. Researcher's Contribution Embedded in the Findings

Although not explicitly stated in the article body (as per academic standards), the researcher's contribution is reflected in:

- designing the Digital Theatre Pedagogical Model (DTPM),
- integrating AI tools into dramatization processes,
- adapting international communicative assessment rubrics to the Algerian context,
- constructing the Digital Theatre Observation Protocol (DTOP),
- developing municipality-based stratified sampling,
- documenting multimodal communicative behaviors rarely studied in Algerian research.

These contributions enhance the methodological rigor and expand the theoretical landscape of digital pedagogy in North Africa.

6.9. Summary of Discussion

The discussion confirms that digital theatre:

- substantially improves communicative competencies,
- enhances multimodal expression,
- supports shy learners,
- strengthens interactional fluency,
- scaffolds linguistic development through AI,
- promotes collaborative learning,
- works consistently across diverse educational contexts.

In sum, the study offers strong evidence that digital theatre is a powerful and scalable pedagogical model for primary education in Algeria and beyond.

7. Conclusion

The present study investigated the impact of digital theatre on the development of communicative competencies among primary school pupils in Annaba during the academic year 2025–2026. Drawing on a mixed-methods design, the study provided compelling evidence that multimodal, AI-enhanced dramatization constitutes an effective pedagogical approach for strengthening linguistic, sociolinguistic, pragmatic, and multimodal aspects of communication among young learners.

The findings demonstrated substantial improvements across all measured dimensions of communicative competence, with statistically significant gains confirmed by paired-sample t-tests ($p < .001$) and large effect sizes (d ranging from 1.49 to 2.10). Moreover, improvements were consistent across municipalities, indicating that digital theatre is equally effective in urban and semi-urban contexts, and can therefore be scaled across the Algerian education system.

Qualitative findings enriched the quantitative results by providing insight into the mechanisms that facilitated communicative growth. Multimodal engagement, collaborative interaction, expressive confidence, and AI-supported script development emerged as core elements driving improvement. Pupils demonstrated stronger turn-taking, clearer articulation, richer vocabulary, enhanced fluency, and greater emotional expression. Teachers reported unprecedented engagement levels and highlighted the value of AI tools in scaffolding language production and improving performance quality.

Overall, the study reinforces the pedagogical relevance of digital theatre as an innovative, context-sensitive, and scalable model for fostering communicative competencies in primary education.

8. Pedagogical Implications

The study yields several educational implications that are essential for teachers, curriculum designers, policymakers, and professional development institutions.

8.1. Implications for Classroom Practice

A. Digital theatre should be integrated into weekly language instruction: Given the significant gains observed, teachers can incorporate short digital drama sessions to reinforce vocabulary, pronunciation, expressive language, and interactional fluency.

B. AI tools should be used as linguistic scaffolds: AI-generated scripts and pronunciation feedback proved valuable in supporting pupils with varied linguistic abilities. Teachers can rely on these tools to personalize learning.

C. Multimodal expression should be encouraged: Allowing pupils to combine speech with gesture, facial expression, and digital avatars deepens communicative engagement and supports reluctant speakers.

D. Performance-based tasks should replace repetitive memorization: Digital theatre provides authentic communication contexts, motivating pupils to use language meaningfully rather than mechanically.

8.2. Implications for Teacher Training

A. Teacher professional development must prioritize digital pedagogy: Many teachers in Algeria have received limited training in technology-enhanced learning. The present study highlights the need for structured training in:

- using interactive boards,

- navigating digital theatre platforms,

- integrating AI into lesson planning.

B. Training should include multimodal literacy: Teachers must learn to guide pupils in using gesture, visual cues, sound, and space as communicative resources—not merely supplements to speech.
C. Professional learning communities (PLCs) should be established: Collaboration among teachers across Annaba's municipalities would enable sharing of best practices, lesson plans, and digital theatre materials.

8.3. Implications for Curriculum Development

A. The primary curriculum should embed digital dramatization as a formal competency: Current Algerian curricula emphasize reading and writing but provide limited opportunities for oral, pragmatic, or multimodal communication. Digital theatre directly addresses these gaps.
B. Competency-based objectives should align with digital performance tasks : Curricular frameworks should explicitly link communicative goals with:

- narrative creation,

- role-play,

- improvisation,

- digital storytelling.

C. AI literacy should be introduced at primary levels: AI tools used in safe, age-appropriate formats can strengthen vocabulary acquisition and stimulate creativity.

8.4. Implications for Educational Policy

A. National adoption of digital theatre is viable: Annaba's 212 digitally equipped primary schools demonstrate that Algeria has the infrastructure to support large-scale implementation.
B. Investment in teacher digital training should be prioritized: Technological tools are only effective when teachers are confident in using them.
C. Schools should be equipped with stable internet and multimedia devices: Although Annaba is well served, rural regions may require additional support to ensure equity.
D. Digital safety protocols must be enforced: Child privacy, ethical use of AI, and safe digital participation need clear policy frameworks.

Ethical Considerations

This study was conducted in full accordance with internationally recognized ethical standards for educational research involving human participants. Prior to data collection, formal authorization was obtained from the relevant educational authorities in Annaba, Algeria. Informed consent was secured from school administrations, teachers, and the parents or legal guardians of all participating pupils. Participation was voluntary, and pupils were informed—through age-appropriate explanations—that they could withdraw at any stage without any negative consequences.

All data were collected and processed anonymously to ensure confidentiality and privacy. No personally identifiable information was recorded or disclosed at any stage of the research. The digital theatre activities and AI-assisted tools used in the study were pedagogically oriented, non-invasive, and designed exclusively for educational purposes, with no psychological or physical risks to participants. The research procedures respected the principles of beneficence, non-maleficence, and equity, ensuring that all pupils were treated fairly regardless of gender, geographical location, or socio-economic background.

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Conflict of Interest

The author declares no conflict of interest related to the conduct, analysis, or publication of this research. No financial, institutional, or personal relationships influenced the study's design, data interpretation, or reporting of results.

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