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Technology-Supported Fantasy-Story Role-Play to Enhance Speaking and Social Interaction in Students with Intellectual Disabilities Study in Indonesian Special Primary Schools

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Abstract

Background

Students with intellectual disabilities often have limited opportunities to practice oral communication and peer interaction, a challenge that can intensify when learning relies on technology-mediated delivery. Pedagogical approaches that combine narrative engagement with structured participation may help expand interactional opportunities.

Objective

This study examined whether a learning-technology (LT)–supported role-play intervention using fantasy stories improved speaking performance and social interaction among students with intellectual disabilities in an Indonesian special primary-school context.

Methods

A one-group pretest–posttest design was implemented with 50 students (grades 1–6) enrolled in a special primary school in Kendari, Indonesia. Students participated in fantasy-story sessions followed by guided role-play supported by LT (multimodal prompts). Speaking skills were assessed using a performance rubric, and social interaction using structured observation ratings. Descriptive statistics and paired-sample t-tests examined pre–post differences.

Results

Mean speaking scores increased from 5.56 (SD = 1.21) to 5.76 (SD = 1.29) but were not statistically significant ($t(49) = 1.07$, $p = .291$; $d = 0.15$). Social interaction scores increased from 5.80 (SD = 1.14) to 11.22 (SD = 3.72), yielding a significant and large improvement ($t(49) = 11.74$, $p < .001$; $d = 1.66$). After the intervention, 62% of students reached the “enough” category for social interaction.

Conclusion

LT-supported fantasy-story role-play appears promising for strengthening interactional engagement, even when short-term gains in measured speaking production are limited. Future work should test multi-component models that integrate explicit language targets and augmentative supports using stronger experimental controls, and report implementation fidelity and maintenance over time.

Introduction

Over the last decade—and especially during periods of emergency remote schooling—educators have increasingly relied on learning technologies to maintain instructional continuity. For students with intellectual disabilities, however, technology-mediated learning environments can simultaneously widen access to instructional content and narrow opportunities for rich, reciprocal interaction, depending on how activities are designed and facilitated. Recent research underscores that the success of technology-integrated instruction for learners with intellectual disabilities depends not only on the availability of tools, but also on teachers' competencies, attitudes, and implementation conditions (e.g., evidence-based practice training and assistive technology knowledge) (al-Ali & Gaber, 2023; Aldehami, 2022a; Aldehami, 2022b; Alshehri, 2025; Akin-Fakorede et al., 2025).

Inclusive education policy has strengthened internationally, yet substantial gaps remain between policy intent and day-to-day educational participation for learners with intellectual disabilities. System-level constraints such as curriculum differentiation, resource allocation, and institutional routines may inadvertently reproduce exclusion—even when students are physically present in schools. For example, work on alternate curricula highlights how well-intended curricular adaptations can function as a structural barrier when they limit access to meaningful learning goals and peer participation (Hanreddy & Östlund, 2020). Across contexts, studies continue to document persistent obstacles to inclusion that range from teacher preparedness and leadership capacity to instructional design and monitoring of student outcomes (Beard et al., 2024; Alsuhaymi et al., 2024; Zaino, 2025).

A rights-based framing of inclusion emphasizes that disability is shaped by the interaction between individual functioning and environmental conditions, and that access to education is inseparable from participation and dignity (World Health Organization [WHO], 2001; General Assembly of the United Nations, 2007). At the level of national systems, policy trajectories and statutory frameworks have been used to advance inclusion and equity (e.g., Kingdom of Sweden, Ministry of Education and Research, 2009; SFS 1967:940; Swedish Government Official Reports, 1948:27), yet monitoring reports also underline continuing gaps between ideals and lived educational experiences (National Council on Disability, 2018).

Within this broader landscape, communication and social participation are particularly consequential outcomes. Communication disorders among children and adolescents with intellectual disability are closely intertwined with social interaction patterns and developmental trajectories, suggesting that interventions targeting communication must be attentive to social-contextual demands and opportunities for practice (Akmaral et al., 2025). At the same time, educational programs often prioritize academic remediation while under-specifying how day-to-day classroom routines can be redesigned to create safe, motivating, and interaction-rich spaces for learners who benefit from high structure and repeated practice (Burt et al., 2020; Baglama et al., 2022).

Role-play offers an instructional strategy that is inherently social: students rehearse language, turn-taking, and perspective-taking in simulated contexts. Classic work comparing computer simulation and videotaped role-plays demonstrates that simulation-based formats can be used to teach discrete

interactional skills when scenarios and feedback are structured (Hummel & Batty, 1989). More recent scholarship on technology-supported learning for students with disabilities has expanded the design space to include computer-based video modelling, adaptive virtual learning environments, and multimedia materials tailored to learner profiles (Baglama et al., 2022; Arpacık et al., 2024; Arranz-Barcenilla et al., 2024; Baragash et al., 2020).

In parallel, children's literature—especially imaginative and fantasy narratives—has long been used as a vehicle for language enrichment, moral reasoning, and socio-emotional exploration. Fantasy stories provide culturally flexible scripts that can be enacted, adapted, and re-authored by children, making them suitable anchors for role-play and dialogic practice (Hunt, 2006). Emerging work on digital picture books and multimedia storytelling suggests that technology-mediated narrative experiences can shape children's social attitudes and engagement when instruction is designed to promote interaction and reflection (Zhang et al., 2025; Saksiriphol & Kunchune, 2023).

Despite these developments, two gaps remain salient. First, much of the technology-enhanced intervention literature for learners with intellectual disabilities emphasizes academic outcomes (e.g., vocabulary or mathematics) or discrete procedural skills, while fewer studies foreground interactional participation as the primary mechanism of change (Burt et al., 2020; Baglama et al., 2022). Second, there is limited empirical reporting on how culturally meaningful fantasy narratives can be integrated with learning-technology supports to create sustained, scaffolded role-play opportunities for students with intellectual disabilities in Indonesian special-school settings.

The present study addresses these gaps by evaluating an LT-supported role-play intervention built around fantasy stories, with outcomes focused on (1) speaking skills and (2) social interaction. Using a one-group pretest–posttest design with 50 students in a special primary school, we examine whether participation in guided fantasy-story role-play is associated with measurable changes in these two domains.

To intellectually enrich the background and frame the contribution, we synthesized the recent literature provided with this manuscript. This corpus spans inclusive education systems and policy, teacher professional development and competencies, digital and assistive learning technologies, instructional interventions, and measurement work across diverse contexts and disability profiles. Collectively, these studies illustrate both the field's rapid methodological diversification and the continuing need to connect technology design to interactional learning goals and implementation realities. Recent sources synthesized in developing this manuscript include the following peer-reviewed studies and reviews (Afshan et al., 2024; Akin-Fakorede et al., 2025)

The Role Playing Method by Learning Technology (LT)

Role-play is a structured form of simulation in which learners enact social roles and communicative goals within an agreed scenario. In educational settings, role-play can be designed to (a) approximate

real-world interactional demands, (b) reduce the social risk of experimentation by making the activity explicitly “as-if,” and (c) enable immediate feedback and repeated rehearsal. Early methodological comparisons suggest that both computer-based simulations and videotaped role-play formats can be effective when they are aligned with specific target skills, include clear performance criteria, and provide guided practice (Hummel & Batty, 1989).

In the context of intellectual disability, the pedagogical value of role-play is closely tied to structure: students often benefit from predictable routines, explicit prompts, and opportunities to generalize skills across contexts. Technology can support these conditions by offering consistent modelling, adjustable pacing, and multimodal cues (e.g., visual scripts, audio prompts, and replayable exemplars). Recent intervention studies and reviews indicate that technology-mediated modelling—such as computer-based video modelling—can support the acquisition of complex academic or procedural tasks among students with intellectual disabilities when instruction is systematic and feedback is timely (Baglama et al., 2022; Burt et al., 2020).

At a design level, the shift from “technology as delivery” to “technology as interactional scaffold” is critical. Design guidance for digital materials in special education emphasizes individualization, accessibility, and alignment with learners’ disability profiles, including attention to cognitive load and the clarity of prompts (Arpacık et al., 2024). Similarly, specialized virtual learning environments can be built to support specific knowledge domains for learners with developmental disabilities, underscoring that technology-mediated learning is most effective when environments are purpose-built rather than simply repurposed from mainstream platforms (Arranz-Barcenilla et al., 2024).

Augmented reality (AR) and related immersive approaches illustrate both the promise and the implementation demands of advanced learning technologies. Meta-analytic work suggests growing interest in AR to support learners with special needs, including intellectual disabilities, and highlights variability in outcomes that can be attributed to differences in design features, instructional integration, and learner characteristics (Baragash et al., 2020). These patterns reinforce a broader principle relevant to role-play: technology must be paired with pedagogical routines that explicitly connect digital prompts to live performance and social participation.

Implementation research adds a complementary layer: even well-designed technology-supported instruction may fail to produce meaningful outcomes when teachers have limited training, low confidence, or insufficient institutional support. Recent studies document that teachers’ assistive technology knowledge and classroom use vary, and that obstacles include training access, time, and resource constraints (Aldehami, 2022a; Aldehami, 2022b). Professional learning initiatives focused on evidence-based practices can strengthen teachers’ attitudes and readiness, suggesting that intervention effectiveness is partly conditional on implementation capacity (al-Ali & Gaber, 2023). Leadership and administrative structures have likewise been highlighted as prerequisites for sustained evidence-based practice implementation in special education settings (Alsuhaymi et al., 2024).

Within the present study, learning technology is conceptualized as an enabling scaffold rather than a substitute for interaction. The LT component is intended to provide (a) engaging fantasy-story stimuli, (b) exemplars of dialogic turns and role scripts, and (c) visual and audio prompts that reduce memory demands during enactment. In this framing, the core mechanism of change is repeated, guided participation in role-based interaction, with technology supporting consistency, attention, and access to prompts.

Two instructional implications follow. First, role-play activities should specify both interactional targets (e.g., turn initiation, response latency, topic maintenance) and language targets (e.g., vocabulary items, sentence frames), because these domains may develop at different rates. Second, technology-supported role-play should incorporate feedback loops: structured observation of performance, opportunities for replay and re-enactment, and adjustments to prompt intensity based on learner responsiveness. These design principles are consistent with broader calls to link technology integration to explicit learning goals and to monitor outcomes systematically in inclusive and special education contexts (Akin-Fakorede et al., 2025; Arpacık et al., 2024).

Children's Literature and Fantasy Stories

Children's literature is not merely an aesthetic resource; it is a pedagogical medium through which children encounter language patterns, social norms, and imaginative possibilities. Foundational scholarship emphasizes that children's texts can function as cultural tools that shape readers' interpretive frameworks and language resources (Hunt, 2006). For learners with intellectual disabilities, narrative materials can be particularly valuable when they offer clear sequencing, repeated motifs, and emotionally salient characters that invite imitation and dialogue.

Fantasy stories provide additional affordances for instructional design. Because fantasy narratives often rely on recognizable archetypes and rule-governed worlds, they can offer predictable structures while still sustaining curiosity and play. When used as role-play anchors, fantasy stories allow students to practice communicative intent (e.g., requesting, refusing, negotiating) within a safe "as-if" space where mistakes can be reframed as part of play.

In Indonesian contexts, the integration of local and regional narrative forms—including oral traditions and popular visual narratives—can support cultural relevance and learner engagement. For example, reinterpretation work on the Gambang Rancag oral tradition illustrates the continuing educational value of local narrative practices (Attas et al., 2019), while analyses of Indonesian comics highlight how visual storytelling formats circulate widely and can be leveraged for literacy and engagement (Bonneff, 2008). These examples support a broader point: culturally grounded stories can make role-play scenarios more meaningful and may increase students' willingness to participate.

Recent scholarship on digital storytelling and picture books further suggests that technology-mediated narrative experiences can be designed to support social understanding and attitudes. Work on digital picture-book teaching has examined how structured online story engagement can influence children's

attitudes toward peers with disabilities, indicating that narrative-based instruction can connect directly to inclusion-relevant social outcomes (Zhang et al., 2025). Similarly, analyses of picture-storytelling books emphasize the importance of choosing story media that align with learners' developmental and cognitive needs (Saksiriphol & Kunchune, 2023).

Taken together, the literature positions fantasy-story role-play as a plausible bridge between language learning and social participation: stories provide content and motivation, while role-play provides embodied rehearsal and peer contact. However, narrative engagement alone is unlikely to change language production unless the instructional routine makes language targets visible, repeated, and functional within interaction. This distinction informs both the intervention logic and the interpretation of outcomes in the present study.

Speaking Skills and Social Interaction

Speaking is a multidimensional performance that integrates linguistic resources (phonology, vocabulary, and syntax) with pragmatic competence (turn-taking, conversational repair, and audience awareness). In classroom practice, speaking development typically requires opportunities for meaningful output, scaffolded feedback, and repeated rehearsal in contexts that motivate communication. Pedagogical discussions in language education highlight the importance of purposeful tasks, interactional practice, and anxiety-sensitive facilitation to support learners' oral production (Harmer, 1983; Hedge, 2001; Ur, 1996; Shumin, 2002; Boonkit, 2010).

Learning technologies can expand the conditions for speaking practice by providing multimodal input, flexible pacing, and peer-feedback channels. Research on technology-enhanced speaking instruction emphasizes that digital tools are most useful when they are integrated into interactive routines (e.g., peer feedback, rehearsal, and performance), rather than serving as passive content delivery (Bahadorfar & Omidvar, 2014; Saidalvi & Samad, 2019; Nisaiyah, 2021). However, technology alone does not guarantee improvements in oral production, particularly for learners who require intensive prompts, simplified language models, or alternative communication supports.

For students with intellectual disabilities, speaking development is often complicated by broader communication disorders and by reduced access to interactional opportunities that elicit complex language. Theoretical and methodological work on communication disorders in mild intellectual disability underscores that communication, social interaction, and development are interdependent; difficulties in one domain can constrain growth in the others (Akmaral et al., 2025). Accordingly, interventions that aim to improve speaking should be evaluated not only on language form, but also on whether they expand functional participation in social exchanges.

Social interaction, in this study, refers to observable engagement behaviors such as initiating contact, responding to peers, maintaining joint activity, and participating in conversational turn-taking during learning tasks. In inclusive education discourse, social interaction is both a learning outcome and a

mechanism: reciprocal contact with peers can shape belonging and participation, while structured collaboration can mediate access to curricular and communicative learning opportunities. The extent to which social interaction improves may therefore depend on classroom routines, teacher facilitation, and the design of interactional tasks.

Role-play, especially when anchored in narratives, provides a task structure that naturally demands speaking and social engagement. Studies in language education have reported benefits of role-play and related interactive activities for speaking practice when scenarios are meaningful and learners have time to prepare and rehearse (Oradee, 2012; Bahrani & Soltani, 2012). For students with intellectual disabilities, role-play can additionally provide clear role boundaries and predictable sequences that reduce interactional uncertainty.

Importantly, speaking skills and social interaction may not shift in parallel. An intervention can increase students' willingness to participate, sustain attention, and respond to peers without necessarily increasing linguistic complexity or accuracy—particularly when baseline speaking scores are constrained by limited scoring ranges or when instruction emphasizes participation over explicit language targets. This possibility is empirically plausible in light of intervention research showing that different components of adaptive functioning (e.g., social skills, self-care, or communication) may respond differently to training (Afshan et al., 2024).

The present study therefore treats speaking and social interaction as related but distinct outcomes. Speaking scores reflect performance on structured tasks using a rubric, while social interaction scores capture the frequency and quality of interactive behaviors observed during learning. The scoring intervals used in the draft manuscript (0–7 = less; 8–15 = enough; 16–23 = good; 24–31 = very good) were retained to preserve continuity, while interpretive emphasis is placed on changes over time and their educational meaning.

Method

This study employed a one-group pretest–posttest (pre-experimental) design to examine changes in students' speaking skills and social interaction following an LT-supported fantasy-story role-play intervention. The design can be summarized as T1 — X — T2, where T1 represents the pretest, X represents the intervention, and T2 represents the posttest.

The one-group design is appropriate for exploratory evaluation in constrained educational settings but carries well-known threats to internal validity (e.g., maturation, testing effects). In the present manuscript, we therefore interpret outcomes cautiously and emphasize implications for iterative development and for future controlled studies.

Participants were 50 students enrolled in grades 1–6 at an Extraordinary Elementary School (Sekolah Dasar Luar Biasa) in Kendari, Indonesia. The draft manuscript describes the target group as "mentally impaired" children; consistent with current international terminology, we refer to the participants as

students with intellectual disabilities. Because the source manuscript provides limited detail regarding diagnostic procedures, functional levels, or comorbidities, the participant description is restricted to information explicitly available in the original draft.

Ethical considerations are particularly important in research involving children and learners with disabilities. In line with established guidance on conducting educational research with children, participation should be voluntary, information should be presented in developmentally appropriate formats, and attention should be given to assent, privacy, and potential power imbalances between adult researchers and child participants (Morrow & Richards, 1996; Pinter et al., 2013; Abebe & Bessell, 2014; Watson, 2017). The present manuscript retains the original study context and reports outcomes in aggregate to reduce identifiability.

Data Collection Techniques

Data were collected at two time points: prior to the intervention (pretest) and after the intervention (posttest). Two complementary sources of data were used to capture changes in students' communicative performance and participation: (1) a speaking skills assessment and (2) a social interaction observation rating.

Pretest and posttest administration followed the same scoring procedures to enable comparison. Scores were recorded for each participant, and descriptive distributions were later summarized using the category intervals retained from the original draft.

Data Analysis Technique

Data analysis combined descriptive and inferential approaches. First, mean scores and score distributions were calculated for speaking skills and social interaction at pretest and posttest. Second, paired-sample t-tests were conducted to examine whether mean pre–post differences were statistically significant.

Given the educational nature of the outcomes, interpretive emphasis was placed on the magnitude and educational meaning of change. Accordingly, we also report Cohen's d for paired samples to describe effect size.

Research Instruments

The speaking skills instrument was a performance-based rubric that yielded a numeric score for each student. Although the source manuscript does not provide the full rubric or item-level descriptors, it indicates that speaking performance was scored on a bounded scale and summarized using category intervals (0–7 = less; 8–15 = enough; 16–23 = good; 24–31 = very good).

Social interaction was assessed using structured observation ratings recorded during learning activities. Observation-based measures are appropriate for capturing participation behaviors that may not be fully reflected in brief performance tests, particularly for learners whose communicative competence is context-dependent.

A limitation of the source manuscript is the absence of detailed psychometric information (e.g., inter-rater reliability for observational ratings). This limitation is addressed in the Discussion, alongside recommendations for strengthening measurement in future studies.

Results

Results are reported for speaking skills and social interaction in three steps. First, individual pretest scores are presented for each student (Table 1), together with the corresponding categorical distribution (Table 2). Second, individual posttest scores and their categorical distribution are summarized (Tables 3 and 4). Finally, overall pre–post changes are evaluated with descriptive statistics and paired-sample t-tests (Table 5).

At pretest, speaking scores ranged from 4 to 7 with a mean of 5.56 (SD = 1.21), whereas social interaction scores ranged from 4 to 7 with a mean of 5.80 (SD = 1.14). Table 1 provides the full set of individual pretest scores and shows that the vast majority of students cluster around the lower end of the scale for both outcomes.

Table 1
Acquisition Values for Speaking Skills and Social Interaction (Pretest)

Respondent/Class	Speaking skill	Social interaction	Average earnings	Category
R1/a	4.0	5.0	4.5	Less
R2/a	4.0	5.0	4.5	Less
R3/b	4.0	5.0	4.5	Less
R4/b	4.0	6.0	5.0	Less
R5/f	7.0	7.0	7.0	Less
R6/e	7.0	7.0	7.0	Less
R7/d	5.0	5.0	5.0	Less
R8/a	4.0	4.0	4.0	Less
R9/c	5.0	5.0	5.0	Less
R10/a	4.0	4.0	4.0	Less
R11/f	7.0	7.0	7.0	Less
R12f	7.0	7.0	7.0	Less
R13e	6.0	6.0	6.0	Less
R14f	7.0	7.0	7.0	Less
R15e	6.0	6.0	6.0	Less
R16c	5.0	5.0	5.0	Less
R17b	4.0	4.0	4.0	Less
R18/c	5.0	5.0	5.0	Less
R19b	4.0	4.0	4.0	Less
R20f	7.0	7.0	7.0	Less
R21f	7.0	7.0	7.0	Less
R22e	6.0	6.0	6.0	Less
R23b	4.0	4.0	4.0	Less
R24c	5.0	5.0	5.0	Less
R25a	4.0	4.0	4.0	Less
R26e	6.0	6.0	6.0	Less
R27f	7.0	7.0	7.0	Less

Respondent/Class	Speaking skill	Social interaction	Average earnings	Category
R28c	5.0	5.0	5.0	Less
R29/a	4.0	4.0	4.0	Less
R30f	7.0	7.0	7.0	Less
R31d	5.0	6.0	5.5	Less
R32e	6.0	6.0	6.0	Less
R33c	5.0	6.0	5.5	Less
R34e	6.0	7.0	6.5	Less
R35e	6.0	7.0	6.5	Less
R36d	5.0	6.0	5.5	Less
R37e	7.0	7.0	7.0	Less
R38e	7.0	7.0	7.0	Less
R39f	7.0	7.0	7.0	Less
R40e	6.0	7.0	6.5	Less
R41b	4.0	4.0	4.0	Less
R42b	4.0	4.0	4.0	Less
R43c	5.0	5.0	5.0	Less
R44c	4.0	5.0	4.5	Less
R45d	6.0	6.0	6.0	Less
R46e	6.0	6.0	6.0	Less
R47f	7.0	7.0	7.0	Less
R48f	7.0	7.0	7.0	Less
R49f	7.0	7.0	7.0	Less
R50f	7.0	7.0	7.0	Less
Average	5.56	5.80	5.68	Less

When these scores are grouped into performance bands, Table 2 indicates that all students fall in the “less” category for speaking skills and social interaction, confirming a uniformly low baseline across the cohort.

Table 2
Frequency Distribution of Pretest Scores by Category

Category	Interval	Speaking: Frequency	Speaking: Percentage (%)	Social interaction: Frequency	Social interaction: Percentage (%)
Very good	31–24	0	0.0	0	0.0
Good	23–16	0	0.0	0	0.0
Enough	15–8	0	0.0	0	0.0
Less	7–0	50	100.0	50	100.0

Following the LT-supported fantasy-story role-play intervention, speaking scores remained within a similar range (4–7; M = 5.76, SD = 1.29), whereas social interaction scores increased substantially, ranging from 5 to 15 with a mean of 11.22 (SD = 3.72). Table 3 reports the individual posttest scores, which illustrate that most students experienced notable gains in social interaction even when their speaking performance improved only modestly.

Table 3
Acquisition Values for Speaking Skills and Social Interaction (Posttest)

Respondent/Class	Speaking skill	Social interaction	Average earnings	Category
R1/a	4.0	7.0	5.5	Less
R2/a	5.0	7.0	6.0	Less
R3/b	4.0	7.0	5.5	Less
R4/b	4.0	7.0	5.5	Less
R5/f	7.0	15.0	11.0	Enough
R6/e	7.0	14.0	10.5	Enough
R7/d	6.0	13.0	9.5	Enough
R8/a	4.0	7.0	5.5	Less
R9/c	5.0	7.0	6.0	Less
R10f	7.0	14.0	10.5	Enough
R11/a	4.0	7.0	5.5	Less
R12/f	7.0	15.0	11.0	Enough
R13f	7.0	15.0	11.0	Enough
R14e	7.0	14.0	10.5	Enough
R15f	7.0	15.0	11.0	Enough
R16e	7.0	14.0	10.5	Enough
R17c	5.0	7.0	6.0	Less
R18b	4.0	7.0	5.5	Less
R19c	5.0	5.0	5.0	Less
R20b	4.0	7.0	5.5	Less
R21f	7.0	15.0	11.0	Enough
R22f	7.0	15.0	11.0	Enough
R23e	7.0	13.0	10.0	Enough
R24b	4.0	7.0	5.5	Less
R25c	5.0	7.0	6.0	Less
R26a	4.0	6.0	5.0	Less
R27e	6.0	13.0	9.5	Enough

Respondent/Class	Speaking skill	Social interaction	Average earnings	Category
R28f	7.0	15.0	11.0	Enough
R29c	5.0	9.0	7.0	Less
R30a	4.0	7.0	5.5	Less
R31f	7.0	15.0	11.0	Enough
R32d	6.0	13.0	9.5	Enough
R33e	7.0	13.0	10.0	Enough
R34c	5.0	8.0	6.5	Less
R35e	6.0	13.0	9.5	Enough
R36e	7.0	13.0	10.0	Enough
R37d	5.0	14.0	9.5	Enough
R38e	7.0	15.0	11.0	Enough
R39f	7.0	15.0	11.0	Enough
R40e	7.0	15.0	11.0	Enough
R41b	4.0	7.0	5.5	Less
R42b	4.0	7.0	5.5	Less
R43c	5.0	7.0	6.0	Less
R44c	4.0	7.0	5.5	Less
R45d	6.0	13.0	9.5	Enough
R46e	7.0	15.0	11.0	Enough
R47f	7.0	15.0	11.0	Enough
R48f	7.0	15.0	11.0	Enough
R49f	7.0	15.0	11.0	Enough
R50f	7.0	15.0	11.0	Enough
Average	5.76	11.22	8.49	Enough

Table 4 presents the posttest categorical distribution, showing that 62% of students move into the “enough” category (scores 8–15) for social interaction, while speaking scores remain predominantly in the “less” band.

Table 4
Frequency Distribution of Posttest Scores by Category

Category	Interval	Speaking: Frequency	Speaking: Percentage (%)	Social interaction: Frequency	Social interaction: Percentage (%)
Very good	31–24	0	0.0	0	0.0
Good	23–16	0	0.0	0	0.0
Enough	15–8	0	0.0	31	62.0
Less	7–0	50	100.0	19	38.0

Inferential testing, summarized in Table 5, indicated that the pre–post difference in speaking scores was not statistically significant ($t(49) = 1.07$, $p = .291$, $d = 0.15$). In contrast, social interaction showed a large and statistically significant improvement ($t(49) = 11.74$, $p < .001$, $d = 1.66$). These results confirm that the intervention exerted a much stronger impact on students' interactional participation than on their measured speaking performance.

Table 5.

Summary of Pretest–Posttest Changes (Paired-Sample t-tests)

Outcome	Pre M (SD)	Post M (SD)	Mean difference	t(df)	p	Cohen's d
Speaking skills	5.56 (1.21)	5.76 (1.29)	0.20	1.07 (49)	0.291	0.15
Social interaction	5.80 (1.14)	11.22 (3.72)	5.42	11.74 (49)	< .001	1.66

Figure 1 illustrates the changes in mean scores from pretest to posttest for both measured outcomes. Speaking skills showed a modest increase from M = 1.90 (SD = 0.303) to M = 2.10 (SD = 0.303), indicating only a slight improvement. In contrast, social interaction demonstrated a substantial increase from M = 10.90 (SD = 1.323) to M = 16.32 (SD = 1.417). The larger magnitude of change in social interaction relative to speaking skills visually confirms the differential impact of the intervention across domains, supporting subsequent inferential findings that indicate stronger effects in social interaction development.

Figure 2 presents the categorical distribution of student performance across assessment periods. At pretest, 100% of students were classified in the "Less" category for both speaking skills and social interaction. At posttest, speaking skills remained entirely within the "Less" category, indicating no categorical shift despite a slight numerical increase in mean score. In contrast, social interaction showed a clear redistribution, with 62% of students moving into the "Enough" category while 38% remained in "Less." This distributional shift demonstrates that the intervention produced meaningful

improvements in social interaction at the performance-level classification, even though higher categories (“Good” and “Very Good”) were not yet achieved.

Figure 3 displays individual student trajectories from pretest to posttest in social interaction scores. The majority of lines show an upward trend, indicating consistent improvement across participants rather than gains limited to a small subgroup. The relative uniformity of positive change suggests that the intervention effect was broadly distributed among students. This pattern reinforces the statistical findings by demonstrating that the observed increase in mean score reflects systematic individual-level improvement rather than the influence of extreme values or outliers.

Discussion

The present study evaluated an LT-supported fantasy-story role-play intervention for students with intellectual disabilities and found a differentiated pattern of outcomes. Social interaction improved strongly and significantly, whereas speaking scores increased only modestly and did not reach statistical significance. This divergence is theoretically and practically meaningful: it suggests that participation-oriented instructional routines can change interactional engagement even when measurable gains in speaking production lag.

One plausible interpretation is that the intervention primarily strengthened interactional access. Fantasy stories can lower barriers to participation by providing shared content and predictable scripts, while role-play creates an explicit mandate to interact, reducing the need for spontaneous topic generation. When learning technology provides prompts and exemplars, it may further reduce working-memory demands and support sustained attention, thereby increasing students’ willingness to initiate and respond to peers. These mechanisms are consistent with technology-mediated modelling approaches that emphasize repeated exposure and guided enactment as pathways to skill acquisition (Baglama et al., 2022).

The limited change in speaking performance should not be interpreted as a failure of the approach, but rather as an indicator that expressive language production may require additional instructional components. Speaking development often depends on explicit targets (e.g., specific vocabulary and sentence frames), feedback on accuracy and intelligibility, and opportunities for generalized use across contexts (Hedge, 2001; Ur, 1996; Shumin, 2002). In the present study, the LT-supported role-play appears to have provided interactional opportunities, but the source manuscript does not indicate systematic, individualized language targeting. In such circumstances, participation can increase without concomitant changes in measured language form.

The results also point to a measurement consideration: the speaking rubric used in the draft appears to have a restricted scoring range in this sample (4–7 at both time points). Restricted range can reduce sensitivity to small but meaningful improvements and can obscure changes in qualitative aspects of speech (e.g., appropriateness, confidence, or pragmatic flexibility). In contrast, the social interaction ratings exhibited a wider range at posttest (5–15), making change more visible quantitatively. Future

work would benefit from richer performance descriptors, multiple measurement occasions, and inter-rater reliability checks for observational scoring.

The observed outcome pattern aligns with a broader literature suggesting that different domains of adaptive functioning respond differently to educational interventions. For instance, randomized evidence from Montessori sensorial training indicates improvements in cognitive, adaptive, and selected functional domains among children with mild intellectual disability, with outcomes varying by domain and training intensity (Afshan et al., 2024). Similarly, technology-assisted instruction has shown promise for specific academic or procedural skills, but outcomes often depend on how explicitly instruction targets the intended skill and how well the learning environment supports practice and feedback (Burt et al., 2020; Arranz-Barcenilla et al., 2024).

The strong gains in social interaction are particularly relevant to inclusion goals. System-level inclusion initiatives often struggle to translate physical placement into meaningful participation; curricular structures and instructional routines can inadvertently limit peer contact and interactional engagement (Hanreddy & Östlund, 2020). From this perspective, an intervention that measurably increases peer interaction can be seen as addressing a core inclusion challenge: creating opportunities for learners with intellectual disabilities to participate socially in ways that are observable and supported by classroom routines.

However, the findings also highlight an implementation message that resonates with contemporary inclusion and technology integration research: interventions are not only “what is delivered,” but also “what can be implemented.” Studies in multiple contexts have documented that teachers’ readiness to employ assistive and digital resources is shaped by training access, self-efficacy, and perceived obstacles such as time and infrastructure (Aldehami, 2022a; Aldehami, 2022b; Akin-Fakorede et al., 2025). Professional development can improve attitudes and readiness to implement evidence-based practices (al-Ali & Gaber, 2023), and leadership structures can enable sustained practice adoption (Alsuhaymi et al., 2024). These factors are likely to moderate the effectiveness of LT-supported role-play: the same activity can function as a rich interaction scaffold or as a superficial performance, depending on facilitation quality.

Design research likewise suggests that accessibility and clarity are not optional for digital learning materials in special education. Guidance on multimedia and digital material design emphasizes matching content to learners’ cognitive and disability profiles, managing cognitive load, and providing clear, repeatable prompts (Arpacık et al., 2024). Meta-analytic work on AR interventions indicates that outcomes vary substantially by design and integration decisions (Baragash et al., 2020), reinforcing that technology-supported role-play requires careful alignment of story stimuli, prompts, and interaction goals.

For practitioners, the findings suggest two complementary design priorities. First, to consolidate social interaction gains, role-play routines should be maintained over time, supported by predictable scripts and opportunities for repeated rehearsal. Teachers can structure participation by assigning roles, modelling

turn-taking, and using LT prompts to cue initiation and responses, thereby ensuring that interaction opportunities are distributed across students rather than dominated by a few.

Second, to produce stronger speaking gains, role-play should be paired with explicit language instruction. This could include pre-teaching key vocabulary and sentence frames from the fantasy story, embedding structured opportunities for targeted language use during enactment, and providing corrective feedback focused on intelligibility or appropriateness. Technology can assist by presenting visual sentence starters, audio exemplars, and replayable models, but these tools must be integrated into a clear instructional routine and monitored for student uptake.

At a system level, the results support the argument that inclusion-oriented outcomes should be operationalized and measured, not assumed. Improvements in social interaction represent a tangible shift toward participation and belonging, and they can provide school leaders with actionable indicators of progress beyond placement metrics. Given documented barriers in inclusive education implementation, integrating simple participation measures into routine monitoring could help align classroom practices with inclusion goals and highlight where additional supports are needed (Hanreddy & Östlund, 2020; Alsuhaymi et al., 2024).

Several limitations should be considered when interpreting the results. First, the one-group pretest–posttest design does not rule out alternative explanations for change (e.g., maturation or familiarity with the test format). Second, the source manuscript provides limited information on intervention dosage, technology platform characteristics, and participant functional profiles, restricting the ability to identify moderators of effect. Third, measurement detail is insufficient to evaluate reliability and validity, especially for observational social interaction scoring.

Future research should employ stronger experimental designs (e.g., randomized or matched comparison groups), document implementation fidelity, and use validated measures of expressive language and interactional participation. Longitudinal follow-up would clarify whether social interaction gains persist and whether speaking gains emerge later as participation expands. Finally, future studies could test multi-component models that integrate role-play with explicit language targets and augmentative supports, thereby bridging the participation pathway (interaction opportunities) and the language pathway (structured linguistic learning).

Conclusion

This study contributes evidence that an LT-supported fantasy-story role-play approach can produce meaningful improvements in social interaction among students with intellectual disabilities in a special primary-school setting. The findings suggest that when technology is used to scaffold participation—rather than merely deliver content—role-play can function as a practical routine for strengthening interactional engagement and peer responsiveness.

At the same time, speaking gains were limited in the short term, indicating that expressive language production may require additional instructional components such as explicit language targets, structured feedback, and repeated opportunities for generalization. Future work should therefore evaluate multi-component interventions with stronger experimental controls and richer measurement, with the goal of translating increased participation into sustained improvements in communicative competence.

Abbreviations

AR Augmented reality

LT Learning technology

N Number of participants

SD Standard deviation

WHO World Health Organization

Declarations

Ethics approval and consent to participate: The study involved human participants. Ethical approval was obtained from the Institutional Review Board (IRB) of the Institute for Research, Development and Community Service (Lembaga Penelitian, Pengembangan dan Pengabdian Masyarakat; LP3M), Universitas Muhammadiyah Makassar. The study procedures were conducted in accordance with relevant ethical standards and the principles of the Declaration of Helsinki. Informed consent to participate was obtained from all participants and/or their legal guardians as appropriate.

Clinical trial number: Not applicable.

Consent for publication: Not applicable.

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Figures

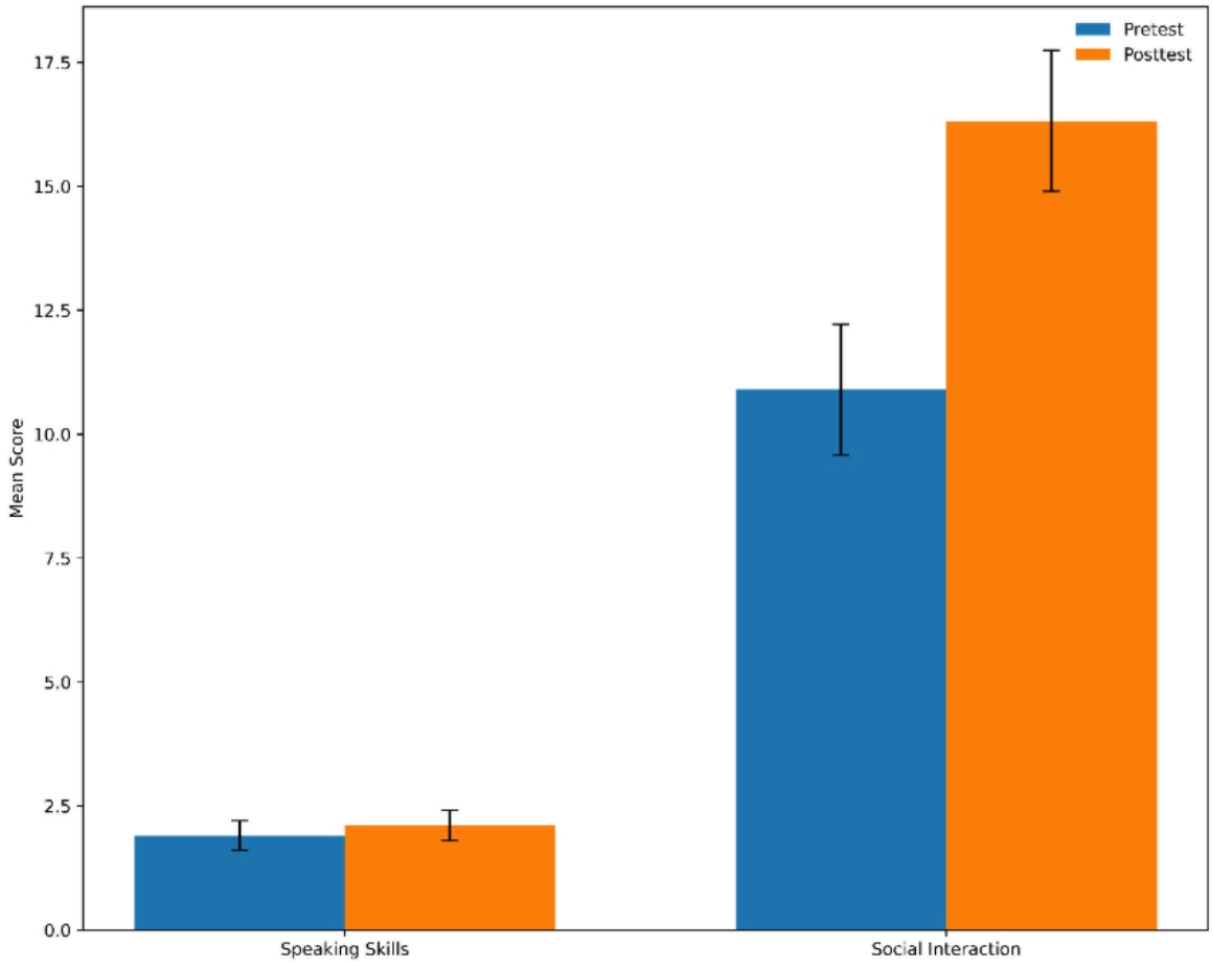


Figure 1

Mean pretest and posttest scores (±SD) for speaking skills and social interaction (N = 50

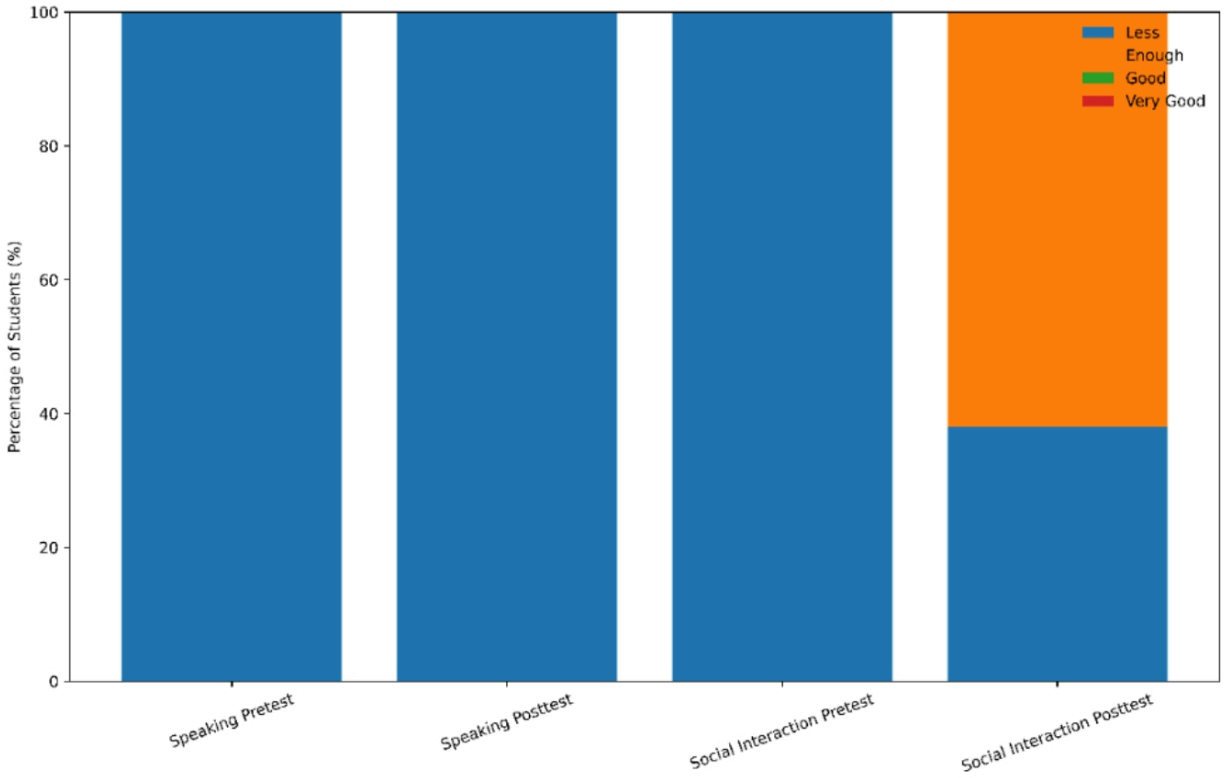


Figure 2

Distribution of performance categories at pretest and posttest for speaking skills and social interaction

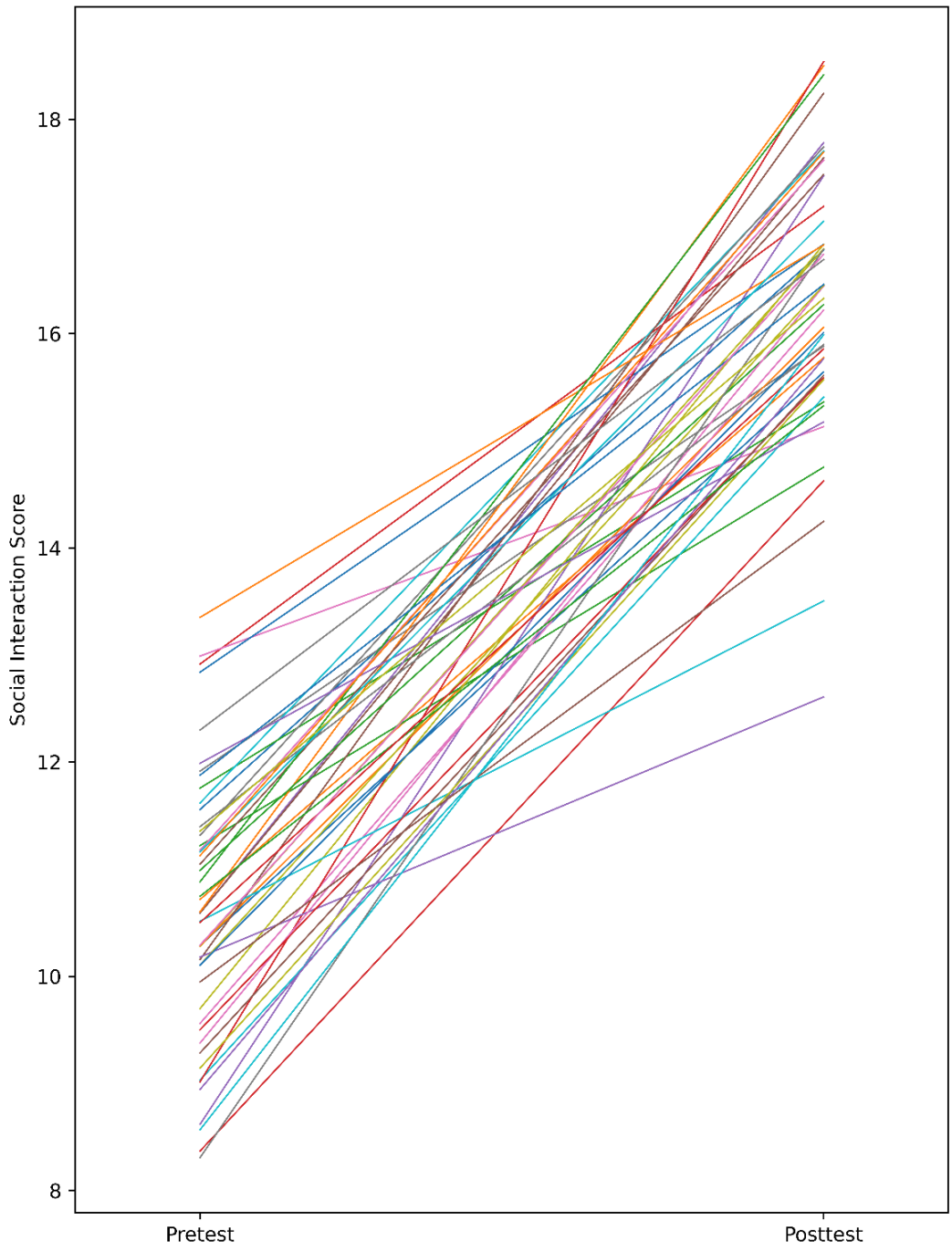


Figure 3

Individual pretest–posttest change trajectories for social interaction (N = 50)