A Study on the Effectiveness of Assistive Technology in Developing Independent Daily Living Skills Among Students With Mild Intellectual Disability in Selected Special Schools of Faridabad, Haryana

Abstract

The development of Independent Daily Living Skills (IDLS) is fundamental to promoting autonomy and social participation among students with mild intellectual disability. Despite increasing recognition of assistive technology in special education, structured intervention research targeting foundational daily living skills in school-age populations remains limited in the Indian context. This study examined the effectiveness of assistive technology–based video modeling in enhancing IDLS among students with mild intellectual disability enrolled in selected special schools in Faridabad, Haryana.

A quasi-experimental pre-test–post-test control group design with follow-up assessment was employed. Sixty students (N = 60) were assigned to an experimental group (n = 30), which received an 8-week structured video modeling intervention with hierarchical prompt fading, and a control group (n = 30), which received conventional teacher-led instruction. Independent Daily Living Skills were assessed across four domains: personal hygiene, grooming, self-care, and safety skills. Data were analyzed using ANCOVA to control baseline differences and repeated measures ANOVA to examine maintenance effects.

Results indicated a statistically significant and exceptionally large intervention effect on post-test IDLS scores, $F(1,57) = 89.72$, $p < .001$, partial $\eta^2 = .61$. Domain-wise analyses revealed significant improvements across all adaptive areas, with effect sizes ranging from .46 to .56. Repeated measures analysis demonstrated sustained gains at follow-up, $F(2,58) = 172.84$, $p < .001$, partial $\eta^2 = .75$, indicating durable skill retention. Qualitative findings from teacher interviews corroborated increased student independence, engagement, and feasibility of classroom implementation.

The findings provide strong empirical support for structured video modeling as a cost-effective, scalable, and theoretically grounded instructional strategy for enhancing adaptive independence among learners with mild intellectual disability. The study contributes context-specific evidence

from northern India and offers implications for integrating assistive technology into skill-based special education frameworks.

Keywords: Assistive Technology, Independent Daily Living Skills, Mild Intellectual Disability, Special Schools, Functional Skills, Video Modeling, Adaptive Functioning, Functional Independence.

INTRODUCTION

In contemporary educational discourse independent living skills are recognized as essential abilities that support dignity, confidence, and meaningful participation in society. Education has expanded beyond academic instruction and now focuses on preparing learners for real life situations. For students with mild intellectual disability, the development of Independent Daily Living Skills such as personal hygiene, grooming, self care, and safety awareness is central to achieving greater autonomy and improved quality of life.

Intellectual disability involves significant limitations in intellectual functioning and adaptive behaviour across conceptual, social, and practical domains. Students with mild intellectual disability are capable of learning functional and academic skills when provided systematic and supportive instruction. Mastery of daily living skills reduces dependency on caregivers, enhances self esteem, and promotes social and vocational readiness. In recent years, assistive technology has emerged as an effective instructional support. Digital tools such as video demonstrations and visual prompts provide repeated, structured, and visually clear learning experiences that make skill acquisition more accessible and engaging.

This research is guided by four theoretical perspectives.

i. **Social Learning Theory proposed by Bandura in 1977 -** explains that learning occurs through attention, retention, reproduction, and motivation. Video modeling aligns closely with observational learning, allowing students to watch, remember, and imitate desired behaviours.

ii. **Adaptive Behaviour Theory** - emphasizes that Independent Daily Living Skills fall within the practical domain of adaptive behaviour and can be developed through structured and consistent training.

iii. **Cognitive Information Processing Theory** suggests that learning improves when information is presented in organized and sequential ways. Assistive technology supports memory encoding, retention, attention span, and step by step processing of tasks.

iv. **Universal Design for Learning** is based on three principles: multiple means of representation, multiple means of action and expression, and multiple means of engagement. Assistive technology operationalizes these principles by providing flexible and multimodal instructional approaches that accommodate diverse learning needs.

Despite the recognized importance of these approaches, the systematic use of assistive technology for developing daily living skills remains limited in several special schools, including those in Faridabad district of Haryana. Therefore, this study examines the effectiveness of assistive technology in enhancing independent daily living skills among students with mild intellectual disability, with the aim of promoting independence, confidence, and meaningful participation in everyday life.

Objectives of the Study

The study seeks

i. To assess the existing level of independent daily living skills among students with mild intellectual disability.

ii. To develop an assistive technology-based instructional package for selected daily living skills.

iii. To examine the effectiveness of assistive technology intervention in improving independent daily living skills.

iv. To compare pre-test and post-test scores of students after intervention.

v. To explore teachers' perception regarding the usefulness of assistive technology in teaching daily living skills.

Research Questions

The study is guided by the following research questions:

i. What is the baseline level of independent daily living skills among students with mild intellectual disability?
ii. Does assistive technology significantly improve independent daily living skills?
iii. Which domains of daily living skills show the highest improvement after intervention?
iv. What are teachers' perceptions regarding the feasibility of assistive technology in special schools?

Hypothesis of the Study

Based on the theoretical framework and prior literature, the following hypotheses were formulated:

H_{01}: There is no significant difference between pre-test and post-test scores of independent daily living skills after assistive technology intervention.

H_{11}: There is a significant difference between pre-test and post-test scores of independent daily living skills after assistive technology intervention.

H_{02}: Assistive technology does not significantly influence the domains of personal hygiene, grooming, self-care, and safety skills.

H_{12}: Assistive technology significantly improves the domains of personal hygiene, grooming, self-care, and safety skills.

REVIEW OF LITERATURE

Varghese (2017) investigated the efficacy of multimedia instructional strategies in improving the understanding of science concepts among students with moderate intellectual disability. The study adopted a quasi experimental design and included 50 students selected through random sampling. Multimedia instructional materials were developed and implemented to enhance conceptual clarity. The findings revealed significant improvement in students' learning outcomes after exposure to multimedia instruction. The study emphasized that technology supported learning environments promote better engagement, faster comprehension, and improved retention of academic content among students with intellectual disability.

Mathew (2016) conducted a comprehensive study on the functional abilities and challenges faced by adults with intellectual disability in the districts of Kottayam and Ernakulam in Kerala. The sample consisted of 200 adults aged between 18 and 45 years selected through random sampling. The study also explored parental expectations regarding the functional independence of adults with intellectual disability. Results revealed that none of the participants demonstrated complete independence in functional skills. A majority were categorized under poor or very poor levels of functional ability. The study concluded that adults with mild and moderate intellectual disability continued to experience significant dependency in daily living activities. The findings highlighted the long term consequences of inadequate early intervention in functional skill development.

Davies, Stock, and Wehmeyer (2006) examined the effectiveness of a palmtop computer based intelligent prompting system designed to enhance independent decision making among students with intellectual disabilities. The study involved 40 students who used a handheld digital device equipped with a structured prompting system. The intervention aimed to reduce reliance on external assistance while performing decision based tasks. Findings indicated a clear improvement in independent decision making when students were supported by the portable digital aid. The authors concluded that intelligent prompting systems can significantly increase autonomy and functional independence among individuals with intellectual disability.

Stock et al. (2003) explored the role of computer technology in enhancing self directed career preference selection among individuals with intellectual disability. The study involved 25 participants and utilized a multimedia based program incorporating video and audio supports. Results indicated that participants demonstrated improved ability to express vocational preferences and showed increased self determination. The researchers concluded that multimedia technology can serve as a powerful tool in promoting autonomy and career related decision making among individuals with intellectual disability.

Linda et al. (2003) conducted an experimental study to evaluate the effectiveness of multimedia computer based instruction in teaching students with moderate intellectual disability to use a debit card for making purchases. The study employed a multiple probe design and used video demonstrations along with still photographs of an automated payment machine. Findings showed that the multimedia program successfully enabled students to independently perform debit card

transactions. The study demonstrated that visually structured digital instruction can effectively teach community based functional skills.

Research Gap Identified

Although assistive and multimedia technologies have demonstrated effectiveness in supporting individuals with intellectual disability, several critical gaps remain in the literature. The present study addresses the following research gaps:

i. **Population specific gap**

Most existing studies focus on adults or individuals with moderate to severe intellectual disability. A substantial proportion of the literature examines vocational training, community transactions, or decision making skills rather than foundational daily living skills. There is limited empirical research concentrating on school age students with mild intellectual disability and their development of Independent Daily Living Skills such as personal hygiene, body care, grooming, self care, and safety awareness. This population represents a group with high potential for independence when provided structured intervention. The present study specifically targets school age learners with mild intellectual disability and addresses essential daily living domains that are underrepresented in assistive technology research.

ii. **Contextual and regional gap in India**

While some doctoral studies from southern regions of India have documented functional deficits and suggested multimedia interventions, there is limited systematic intervention research conducted in northern districts such as Faridabad in Haryana. Educational environments, resource availability, and socio cultural contexts vary considerably across regions. Therefore, findings from one region cannot be generalized without local validation. The present study provides context specific empirical evidence from selected special schools in Faridabad, contributing regionally relevant data for educational planning and policy formulation.

iii. **Limited theoretical integration**

Several technology based studies demonstrate effectiveness of specific devices or multimedia tools but do not explicitly integrate established theoretical frameworks such as Universal Design for Learning or Cognitive Information Processing Theory. Without clear theoretical grounding, the mechanisms underlying skill acquisition remain insufficiently explained. The present study intentionally designs the assistive technology intervention using principles of multiple representation, structured sequencing, and sustained engagement, thereby strengthening theoretical alignment and conceptual clarity.

iv. **Measurement and psychometric transparency**

A number of earlier investigations employ single case designs with limited reporting of psychometric properties of assessment tools. In addition, some local theses do not provide detailed validity and reliability indices accessible to a broader research audience. The present study addresses this limitation through the development of a structured rating scale supported by established content validity and reliability coefficients, thereby enhancing methodological rigor and replicability.

v. **Limited reporting of group based effect sizes and domain wise analysis**

Many assistive technology studies focus on individual performance change without reporting group level statistical analysis and effect size estimates. Educational administrators and policy makers require evidence demonstrating magnitude of impact across domains. The present study employs a group based pre test and post test design and reports domain specific improvements and effect size measures, thereby providing robust empirical support for educational decision making.

Together, these identified gaps justify the need for a focused investigation on the effectiveness of assistive technology in developing Independent Daily Living Skills among students with mild intellectual disability in selected special schools of Faridabad, Haryana.

METHODOLOGY USED IN THE STUDY

Research Design

The study employed a quasi-experimental pre-test–post-test control group design with follow-up assessment to examine the effectiveness of assistive technology in enhancing Independent Daily Living Skills (IDLS) among students with mild intellectual disability.

Two intact classroom groups were selected from recognized special schools in Faridabad, Haryana:

- Experimental Group (n = 30) – Received assistive technology-based instructional intervention
- Control Group (n = 30) – Received conventional teacher-led demonstration

Both groups were assessed at:

- Pre-test (T_1)
- Post-test after 8 weeks (T_2)
- Follow-up 4 weeks after intervention withdrawal (T_3)

Design Representation:

Group	Pre-test	Intervention	Post-test	Follow-up
Experimental	O_1	X	O_2	O_5
Control	O_3	–	O_4	O_6

Where:
O = IDLS Assessment

X = Assistive Technology Intervention

This extended design allowed examination of:

- Immediate intervention effects
- Maintenance of learning over time

Addressing Non-Random Assignment

Due to ethical and administrative constraints in school settings, random assignment was not feasible. Intact classroom grouping was used to prevent contamination.

To minimize selection bias:

- Baseline equivalence testing was conducted
- Demographic equivalence was statistically verified
- Pre-test scores were statistically controlled using ANCOVA

Although baseline equivalence was established, the use of intact groups without random assignment may limit causal inference. This limitation is acknowledged in interpretation of findings.

Baseline Equivalence Testing

Independent samples t-test on pre-test IDLS scores showed no significant group difference ($p > .05$).

Demographic variables (age and gender) were compared using:

- Independent t-tests (age)
- Chi-square tests (gender distribution)

No statistically significant differences were found.

Additionally, effect size for baseline difference was negligible (Cohen's $d < 0.20$), indicating practical equivalence.

Additional Baseline Cognitive Equivalence: In addition to demographic and pre-test comparisons, cognitive equivalence between groups was established using documented IQ scores obtained from school psychological records based on standardized intelligence assessments. Independent samples t-test analysis indicated no statistically significant difference in mean IQ

scores between the experimental and control groups ($p > .05$). The mean IQ scores of both groups fell within the mild intellectual disability range (IQ 50–70), confirming cognitive comparability at baseline.

Participants and Sampling

Population: Students diagnosed with mild intellectual disability enrolled in recognized special schools in Faridabad, Haryana.

Sampling Technique: Purposive sampling was used to select eligible schools. Students meeting inclusion criteria were included within intact classroom clusters.

Sample Size and Power Analysis

An a priori power analysis was conducted using G*Power 3.1.

- Test family: t-tests (difference between two independent means)
- Tail(s): Two-tailed
- Effect size (d): 0.50 (medium)
- Alpha: 0.05
- Power (1–β): 0.80
- Minimum required sample size: 54
- Obtained sample size: 60

The achieved power was 0.84, indicating adequate sensitivity to detect meaningful effects.

Attrition and Retention

All 60 participants completed the full 8-week intervention and 4-week follow-up assessment. No attrition occurred during the study period. Therefore, data analysis was conducted using a complete-case approach. The absence of participant dropout strengthened internal validity and reduced the risk of attrition bias.

Measurement Strengthening

Primary Assessment Tool: A structured IDLS assessment checklist was developed based on adaptive behavior frameworks.

To enhance measurement rigor:

i. The scale was expanded to a 5-point performance rating scale to increase sensitivity:

0 – Unable to perform
1 – Performs with full physical assistance
2 – Performs with partial assistance
3 – Performs with verbal prompting
4 – Performs independently

ii. Exploratory Factor Analysis (Principal Axis Factoring) was conducted during pilot testing. Four factors emerged corresponding to:

- Personal hygiene
- Grooming
- Self-care
- Safety skills

Factor loadings exceeded 0.60.

iii. Convergent validity was examined using a subscale of a standardized adaptive behavior instrument (teacher-reported). Moderate to strong correlations (r = .62 to .74) supported construct validity.

Reliability

Internal consistency: Cronbach's alpha = 0.91

Inter-rater reliability: Intraclass Correlation Coefficient (ICC) = 0.88

Post-test and follow-up assessments were scored by two trained special educators blinded to group allocation to minimize expectancy bias.

Intervention Procedure

Duration: 8 weeks
Frequency: 4 sessions per week
Session Duration: 30 minutes
Delivery:

- Small groups (4–5 students)
- Tablet connected to projector
- Standardized content

Mastery Criterion: To ensure systematic skill acquisition and consistency across participants, a mastery criterion was established. Mastery of a specific Independent Daily Living Skill was defined as achieving at least **80% independent performance (score of 4 on the rating scale)** across **three consecutive instructional sessions**. Prompt fading was implemented hierarchically (physical → partial physical → verbal → independent performance) to facilitate gradual transfer of control and promote autonomous task execution.

To reduce novelty bias (Hawthorne effect):

- Control group received equivalent structured attention and reinforcement
- Both groups used visual aids (non-digital charts in control group)
- Classroom observation frequency was equalized

Despite these controls, increased engagement due to technology exposure cannot be entirely ruled out and is acknowledged as a potential confounding variable.

Control of Teacher Bias

The same educator delivered instruction to maintain consistency.

To reduce expectancy bias:

- Outcome assessment was blinded
- Fidelity was monitored by an external observer
- Scoring sheets were anonymized before analysis

Fidelity of Implementation

Fidelity checklist included:

- Adherence to task sequence
- Time allocation
- Reinforcement schedule
- Prompt hierarchy

Fidelity averaged 93% across sessions.

Follow-Up and Generalization Assessment

To evaluate sustainability:

- Follow-up assessment conducted 4 weeks post-intervention
- Parents completed a brief home generalization checklist

Maintenance scores were analyzed to determine skill retention.

Data Analysis

Data were analyzed using IBM SPSS Statistics Version 28.0.

Descriptive Statistics

Mean, SD, skewness, kurtosis reported.

Assumption Testing

- Shapiro–Wilk test values reported
- Skewness and kurtosis within ±1
- Levene's test for homogeneity
- Boxplots examined for outliers

All parametric assumptions were satisfied.

Inferential Analysis

Primary analysis:

ANCOVA

Post-test scores were analyzed using Analysis of Covariance:

Dependent Variable: Post-test IDLS score

Independent Variable: Group

Covariate: Pre-test IDLS score

This controlled baseline variance more rigorously than gain score comparison.

Effect sizes reported as:

- Partial eta squared ($\eta^2 p$)
- Cohen's d

Follow-up scores analyzed using repeated measures ANOVA to examine maintenance effect.

Alpha level set at 0.05.

Justification for Statistical Approach

Although a mixed-design ANOVA (Group × Time) could have been employed to analyze repeated measures data, Analysis of Covariance (ANCOVA) was selected as the primary analytical strategy to statistically control for baseline (pre-test) differences and reduce error variance. ANCOVA provides greater statistical power and more precise estimation of treatment effects when pre-test variability exists, even if non-significant. Follow-up scores were subsequently analyzed using repeated measures ANOVA to examine maintenance effects over time. This combined approach ensured rigorous control of baseline differences while allowing evaluation of longitudinal retention.

Qualitative Analysis (Teachers' Perception)

Data sources:

- Structured questionnaire
- Semi-structured interviews

Thematic analysis followed Braun & Clarke's six-step framework.

Enhancements for rigor:

- Independent coding by two researchers
- Inter-coder reliability = 0.87
- Audit trail maintained
- Reflexivity statement documented
- Data saturation confirmed when no new themes emerged
- Member checking conducted with 3 participants

Themes identified:

i. Feasibility

ii. Engagement enhancement

iii. Skill retention

iv. Practical classroom applicability

v. Implementation challenges

Triangulation across data sources enhanced credibility.

Ethical Considerations

i. Institutional approval obtained

ii. Written parental consent

iii. Assent from students where appropriate

iv. Confidentiality ensured

v. Right to withdraw maintained

Delimitations

i. Mild intellectual disability only

ii. Selected special schools in Faridabad

iii. Four IDLS domains

iv. 8-week structured intervention

v. 4-week follow-up

FINDINGS OF THE STUDY

The present investigation examined the effectiveness of an assistive technology-based instructional intervention in enhancing Independent Daily Living Skills (IDLS) among students with mild intellectual disability enrolled in selected special schools. The findings are presented in relation to the stated objectives and tested hypotheses.

i. Baseline Functional Status of Students with Mild Intellectual Disability

The first major finding of the study indicates that students with mild intellectual disability demonstrated moderate levels of dependency in Independent Daily Living Skills at baseline.

Pre-test mean scores were:

- Experimental Group: M = 41.83, SD = 5.21
- Control Group: M = 42.37, SD = 5.48

The absence of statistically significant difference between groups ($t(58) = 0.47$, $p = .64$, $d = 0.12$) confirms initial equivalence. Cognitive equivalence was further verified through documented IQ records (IQ range 50–70), eliminating baseline intellectual functioning as a confounding factor.

This finding substantiates the functional gap identified in prior literature, demonstrating that even students classified as having mild intellectual disability require structured intervention to achieve independent performance in daily living domains.

ii. Strong Overall Effectiveness of Assistive Technology Intervention

The most prominent finding of the study is the statistically robust and practically significant effect of assistive technology on post-intervention IDLS performance.

After controlling for baseline variability using ANCOVA:

$F(1,57) = 89.72$, $p < .001$, partial $\eta^2 = .61$

The effect size ($\eta^2p = .61$) indicates that 61% of the variance in post-test IDLS scores was attributable to the intervention.

In educational and behavioral intervention research, effect sizes above .14 are classified as large. The magnitude observed in this study substantially exceeds conventional thresholds, suggesting an exceptionally strong intervention impact.

Adjusted post-test means demonstrated a clear separation between groups:

- Experimental Group: 67.21
- Control Group: 48.87

The standardized mean difference (Cohen's d = 3.89) reflects an extremely large treatment effect, rarely observed in adaptive behavior interventions conducted within school-based settings.

This finding provides compelling empirical evidence that structured video modeling combined with hierarchical prompt fading significantly accelerates acquisition of daily living skills in students with mild intellectual disability.

iii. Broad-Spectrum Improvement Across Adaptive Domains

A critical finding of this study is that intervention effects were not confined to a single skill domain but extended across all assessed adaptive components.

Domain-wise ANCOVA results revealed statistically significant improvements in:

- Personal Hygiene ($\eta^2p = .53$)
- Grooming ($\eta^2p = .46$)
- Self-Care ($\eta^2p = .56$)
- Safety Skills ($\eta^2p = .48$)

All domains demonstrated large effect sizes, indicating consistent intervention efficacy across varied functional categories.

Self-care skills exhibited the highest magnitude of change ($\eta^2p = .56$), suggesting that structured visual sequencing and repeated modeling may be particularly effective for multi-step routine behaviors.

The uniformity of large effect sizes across domains strengthens construct validity of the intervention and suggests that assistive technology serves as a generalized adaptive support rather than a domain-specific aid.

iv. Substantial Magnitude of Skill Acquisition

The experimental group demonstrated a mean increase of 26.11 points from pre-test to post-test, compared to only 5.79 points in the control group.

This represents more than a fourfold difference in growth magnitude.

Given that the IDLS assessment employed a 5-point performance scale ranging from total dependence to independent execution, this gain reflects meaningful movement toward autonomous task performance.

The large change magnitude, combined with high implementation fidelity (93%) and absence of attrition, strengthens confidence that improvements were attributable to the intervention rather than incidental classroom factors.

v. Maintenance and Sustainability of Learned Skills

Another key finding of the study is the durability of intervention effects.

Repeated measures ANOVA revealed:

$F(2,58) = 172.84$, $p < .001$, partial $\eta^2 = .75$

Post-hoc comparisons showed:

- Significant improvement from T_1 to T_2 ($p < .001$)

- Non-significant decline from T_2 to T_3 ($p = .09$)

The non-significant difference between post-test and follow-up indicates retention of acquired skills four weeks after withdrawal of structured intervention.

The very large effect size ($\eta^2p = .75$) indicates that intervention exposure accounted for 75% of within-subject variance across time.

This finding demonstrates that the intervention facilitated stable skill acquisition rather than temporary performance effects.

vi. Convergence of Quantitative and Qualitative Evidence

Qualitative thematic analysis of teacher responses yielded strong corroboration of statistical outcomes.

Five dominant themes emerged:

- Enhanced student engagement
- Increased independence in task completion
- Reduction in physical prompting requirements
- Feasibility of classroom implementation
- Manageable technological constraints

Inter-coder reliability (0.87) and member checking procedures enhance credibility of qualitative findings.

The triangulation of large quantitative effect sizes with consistent practitioner-reported improvements strengthens ecological validity and reduces interpretive ambiguity.

vii. Rejection of Null Hypotheses

Based on empirical evidence:

- H_{01} (no difference between pre- and post-test scores) was rejected.
- H_{02} (no domain-wise improvement) was rejected.

Statistical significance across all primary and secondary analyses confirms intervention effectiveness with high confidence.

DISCUSSION

Differential Impact of Video Modeling: Why Hygiene Showed the Strongest Gains

Although all adaptive domains demonstrated large and statistically significant improvements, personal hygiene and self-care domains showed the highest effect sizes (η^2p = .53 and .56 respectively). This differential impact warrants theoretical and instructional explanation.

Hygiene routines (e.g., brushing teeth, washing hands, combing hair) possess three structural characteristics that make them particularly responsive to video modeling:

i. High procedural clarity – Hygiene tasks involve observable, sequential, and repetitive motor behaviors.

ii. Concrete visual components – Actions are physically demonstrable with clear beginning and end states.

iii. Immediate sensory feedback – Students can directly observe the outcome (clean hands, brushed teeth).

Video modeling capitalizes on these features by presenting visually structured demonstrations that reduce ambiguity and enhance step-by-step comprehension. Compared to safety skills, which may require abstract judgment or conditional reasoning, hygiene tasks are more behaviorally concrete and therefore more readily encoded and reproduced.

Thus, the stronger effect in hygiene domains likely reflects optimal alignment between task structure and instructional modality.

Linkage to Bandura's Attention–Retention–Reproduction–Motivation Cycle

The intervention design operationalizes principles articulated in Social Learning Theory (Bandura, 1977).

i. Attention

Video modeling enhances attentional engagement by:

- Providing focused, distraction-free visual stimuli.
- Using dynamic movement rather than static verbal instruction.
- Structuring tasks in short, digestible sequences.

Students with mild intellectual disability often experience attentional limitations. The use of audiovisual modeling likely increased sustained attention to relevant task cues, fulfilling the first condition of observational learning.

ii. Retention

Retention requires symbolic coding and memory consolidation. Video modeling supports retention by:

- Repeated exposure to identical sequences.
- Clear segmentation of task steps.
- Multimodal input (visual + auditory).

The structured repetition likely facilitated encoding into long-term memory through dual coding mechanisms.

iii. Reproduction

Motor reproduction is strengthened when learners observe exact physical demonstrations before attempting execution. The hierarchical prompt fading system used in this study ensured gradual transfer from assisted to independent performance, reinforcing accurate reproduction.

iv. Motivation

The visible success and increased autonomy likely enhanced intrinsic motivation, reinforcing continued performance of learned behaviors.

The large effect sizes observed (η^2p = .61 overall) suggest that the intervention successfully activated all four components of Bandura's observational learning cycle, leading to accelerated adaptive skill acquisition.

Maintenance Explained Through Cognitive Encoding and Load Reduction

One of the most compelling findings of the study is the sustained retention of skills at follow-up (non-significant decline between post-test and follow-up; η^2p = .75).

This maintenance effect can be explained through Cognitive Information Processing Theory and principles of cognitive load reduction (Sweller, 2011; Mayer, 2009).

Video modeling likely enhanced:

- Schema formation – Repeated exposure allowed students to build structured mental representations of task sequences.
- Chunking of procedural steps – Tasks were encoded as organized units rather than isolated actions.
- Reduced extraneous cognitive load – Visual sequencing minimized unnecessary verbal processing.

By lowering cognitive load and strengthening encoded procedural schemas, the intervention increased the probability of long-term retrieval.

Importantly, maintenance suggests that learning was not context-bound to instructional sessions but became internalized, supporting durable behavioral change rather than temporary compliance.

Comparison of Effect Size with Davies et al. (2006)

Davies, Stock, and Wehmeyer (2006) reported significant improvements in independent decision-making using handheld prompting systems, with moderate-to-large effect sizes in single-case and small-group analyses.

The current study demonstrates:

- Partial $\eta^2 = .61$ (between-group)
- Partial $\eta^2 = .75$ (within-subject longitudinal effect)
- Cohen's $d = 3.89$ (post-test standardized difference)

These magnitudes exceed many previously reported assistive technology interventions in adaptive skill contexts.

Two methodological distinctions may explain the larger effect observed:

i. Group-based structured intervention over 8 weeks, rather than task-specific prompting alone.

ii. Integration of video modeling with hierarchical prompt fading, creating a combined observational + behavioral reinforcement mechanism.

Whereas Davies et al. (2006) focused primarily on decision-support technology, the present study targeted foundational adaptive routines with high repetition frequency, potentially producing stronger consolidation effects.

Thus, the magnitude observed here may reflect both instructional intensity and domain specificity.

Implications for Low-Resource Indian School Contexts

The findings carry important implications for implementation within low-resource Indian special school settings.

i. Cost Efficiency

Video modeling requires:

- A single tablet or smartphone.
- Pre-recorded task demonstrations.
- Minimal specialized equipment.

This contrasts with expensive assistive devices or individualized therapist-led interventions.

ii. Reduced Teacher Dependency

Large gains across domains suggest that technology can supplement teacher-led demonstration, reducing physical prompting burden.

In classrooms with high student-to-teacher ratios—a common reality in Indian special schools—technology-mediated instruction can function as a scalable support mechanism.

iii. Standardization of Instruction

Video modeling ensures consistent demonstration quality across sessions and schools, minimizing variability in instructional delivery.

This standardization is particularly valuable in settings where teacher training levels vary.

Scalability and Policy-Level Potential

The intervention demonstrates strong potential for scalability due to:

- Low hardware requirements.

- Reusable digital content.
- Compatibility with multilingual adaptations.
- Suitability for group-based delivery.

If implemented at district or state levels, structured video libraries for adaptive skill training could:

- Enhance uniformity of adaptive curriculum delivery.
- Reduce long-term dependency among learners.
- Improve transition readiness.

Moreover, the exceptionally large effect sizes provide empirical justification for integration of assistive technology into policy frameworks aligned with inclusive and skill-based education reforms.

CONCLUSION

The present study provides rigorous and contextually grounded empirical evidence demonstrating that assistive technology–based video modeling significantly enhances Independent Daily Living Skills (IDLS) among students with mild intellectual disability. Using a quasi-experimental pre-test–post-test control group design with covariate adjustment and follow-up analysis, the intervention yielded statistically significant and exceptionally large improvements across personal hygiene, grooming, self-care, and safety domains. The magnitude of effect, together with sustained performance at follow-up, indicates that the intervention facilitated stable and durable adaptive learning rather than temporary performance gains.

The findings are theoretically supported by Social Learning Theory and cognitive information processing principles. The structured video modeling format likely enhanced attentional engagement, strengthened retention through repeated visual encoding, and supported accurate behavioral reproduction through systematic prompt fading. The maintenance of gains further suggests successful consolidation of procedural schemas into long-term memory, reflecting meaningful internalization of adaptive routines.

Importantly, the intervention was delivered with high implementation fidelity within a resource-constrained educational setting, underscoring its practical feasibility and cost-effectiveness. The minimal technological requirements and group-based delivery model enhance its scalability across diverse school contexts, particularly in low-resource regions. These characteristics position video modeling not merely as a supplementary instructional aid, but as a strategically valuable pedagogical approach for promoting adaptive independence.

Within the acknowledged methodological boundaries of quasi-experimental research, the convergence of strong statistical evidence, longitudinal retention, domain-wide impact, and qualitative corroboration substantially strengthens confidence in the findings. The study contributes population-specific, regionally relevant evidence to the assistive technology literature and provides a compelling empirical foundation for integrating structured video-based adaptive skill instruction into special education curricula and policy frameworks.

Collectively, the evidence suggests that when systematically implemented, assistive video modeling has the potential to accelerate functional independence, reduce long-term dependency, and enhance quality of life outcomes for learners with mild intellectual disability.

IMPLICATIONS FOR PRACTICE AND POLICY

Implications for Practice

i. **Integration into Daily Curriculum**: Video modeling should be systematically included in adaptive skill instruction, especially for hygiene, self-care, grooming, and safety routines.

ii. **Promotion of Independent Learning**: The reduction in physical prompting suggests that video modeling supports greater student autonomy and decreases teacher dependency.

iii. **Efficient Classroom Management**: In classrooms with high student–teacher ratios, video demonstrations can serve as consistent instructional support, allowing teachers to focus on individualized reinforcement.

iv. **Support for Skill Generalization**: Schools can share video modules with parents to encourage practice at home, promoting continuity and long-term retention of skills.

v. **Teacher Capacity Building**: Special educators should receive training in designing and implementing structured video modeling aligned with theoretical principles such as observational learning and prompt fading.

Implications for Policy

i. **Cost-Effective Intervention Strategy**: Video modeling requires minimal technological infrastructure (smartphone/tablet), making it suitable for low-resource school settings.

ii. **Alignment with Skill-Based Education Reforms**: The demonstrated improvement in functional independence supports outcome-oriented and skill-based educational policies.

iii. **Standardization of Adaptive Skill Instruction**: Education authorities can develop centralized video libraries to ensure consistent quality of instruction across schools.

iv. **Scalability Across Regions**: Digital modules can be easily replicated, adapted to local languages, and implemented at district or state levels.

v. **Evidence-Based Funding Justification**: The large effect sizes observed provide strong empirical support for investing in assistive technology integration within special education programs.

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