



Development and Preliminary Evaluation of Kosaisyarat Sign-Oriented Video Media to Support Interpersonal Communication among Deaf Elementary School Students

Aji Pangestu^{1*}, Hisbullah Huda²

¹Sekolah Tinggi Agama Islam Al-Anwar Sarang, Indonesia

²Universitas Islam Negeri Sunan Ampel Surabaya, Indonesia

*Corresponding author: ajipangestu@staialanwar.ac.id

Abstract

Accessible signed communication is essential for deaf students' participation in elementary education, yet the feasibility and classroom use of sign-oriented video media to support interpersonal communication require further investigation. This study aims to develop and preliminarily evaluate Kosaisyarat, a sign-oriented instructional video designed to support interpersonal communication among deaf elementary school students. The study employed a research and development approach guided by the ADDIE model, incorporating expert validation and a one-group pretest–posttest evaluation involving eight fourth-grade deaf students at State Special School (SDLB) in Semarang, Indonesia. Data were collected through observations, interviews, documentation, expert validation sheets, student-response questionnaires, and interpersonal communication assessments. The findings revealed favorable media and subject-matter expert evaluations, with feasibility scores of 86.6% and 96%, respectively. Four student-feedback items scored between 85 and 95, while classroom observations documented students attending to the video, imitating signs, and participating in learning activities. A paired-samples t-test indicated significantly higher interpersonal communication scores following implementation ($p = .009$). However, the small sample and absence of a comparison group limit causal interpretations. These findings contribute preliminary evidence for integrating signed vocabulary, visual content, and teacher-guided interaction, with implications for accessible elementary instruction and future controlled evaluations.

ARTICLE HISTORY

Received:

27 November 2025

Accepted:

20 September 2026

Published:

30 September 2026

KEYWORDS

deaf pupils;
interpersonal
communication;
sign-language
vocabulary; video-
based learning;
Kosaisyarat



1. Introduction

Interpersonal communication supports social participation and learning because pupils must express ideas, respond to others, and negotiate meaning during classroom activities (Deng, 2024; Miao et al., 2022; Yang et al., 2023; Zheng, 2022). For deaf pupils who communicate through sign language, such participation depends in part on access to comprehensible signed input,



opportunities to express signs, and responsive interaction. Deaf pupils have diverse linguistic histories and communication preferences; consequently, hearing status alone does not determine their language needs. Research on sign language development highlights the importance of accessible opportunities for language use (Thierfelder et al., 2024), while teachers' accounts of lexical gaps suggest that limited access to relevant signs can complicate the explanation of curricular concepts (Kashif & Parveen, 2025). At the elementary level, the educational issue is therefore not merely whether media contain pictures or signs, but whether they provide language content that can be used in reciprocal interactions with teachers and classmates.

Research on deaf learners further connects language access with educational and social experiences. Terlektsi et al. (2020) investigated peer relationships among deaf and hard-of-hearing adolescents, showing why communication opportunities warrant attention when evaluating school participation. Hardman et al. (2022) examined early social communication and later language outcomes among children with cochlear implants; the specificity of that population cautions against treating their findings as universal for all deaf pupils. More recent evidence provides additional support for language-focused approaches. Jønsberg et al. (2025), in a systematic review and meta-analysis of interventions for deaf and hard-of-hearing children aged 6–12, reported promising effects on meaning-based language outcomes while identifying weaknesses in the reporting quality of existing studies. These findings establish a rationale for developing accessible instructional materials, but changes in language performance should not automatically be equated with changes in interpersonal communication.

Related literature addresses sign language knowledge, reading, and visual pedagogy. Studies of sign-language vocabulary and literacy have investigated lexical quality, comprehension, and language relationships (Beaujard & Perini, 2022; Paul & Yan, 2023; Sehyr & Emmorey, 2022). A research synthesis by Zhang et al. (2024) examined associations between sign language competence and spoken or written language development among bilingual deaf learners. Pedagogical research has also highlighted the need to account for learners' visual and signed communication experiences rather than assume that a single visual learning style characterizes all deaf pupils (F. M. Rodrigues et al., 2022). In general elementary education, video-based materials have been investigated in relation to motivation and cognitive learning outcomes (Hita et al., 2024; Ismiyanti et al., 2023). This evidence supports the examination of visual and signed media, but the constructs of vocabulary learning, comprehension, engagement, and interpersonal communication remain distinct and require appropriate assessment.

Emerging studies more directly address digital video and sign-oriented instruction. For example, Marliana et al. (2025) developed interactive sign language videos for initial reading instruction at an Indonesian special school, while Narayana (2024) examined interactive videos with sign language integration in an inclusive fourth-grade classroom. Khasawneh (2023) identified contextual conditions that facilitate and obstruct the use of video in distance education for deaf learners. These studies provide useful points of comparison, but their reported outcomes mainly concern reading, language content, accessibility, or classroom use. It is therefore still necessary to investigate the development, expert appraisal, and preliminary communication outcomes of a sign-vocabulary video designed specifically for interpersonal participation in an Indonesian special elementary classroom. This gap concerns the correspondence between product design and the measured outcome, rather than a claim that video resources for deaf pupils have never been studied.

Marwah et al. (2025) developed interactive media for Arabic vocabulary using the ADDIE model, combining expert appraisal with pretest–posttest assessment. Their findings support the relevance of evaluating both product quality and learning outcomes in school-based media development. However, their participants, language modality, and measured achievement differ from those in the present study. Kosaisyarat consequently addresses a narrower, disability-specific question: how signed curricular video can be designed for classroom use and evaluated against interpersonal communication rather than vocabulary achievement alone.

The need for a context-specific resource also emerged in preliminary observations at the State Special School (SDLB) of Semarang. According to the study's observations, lessons were largely organized around teacher explanation, while communication among pupils was limited. Some pupils experienced difficulty expressing ideas to classmates because their available sign vocabulary was restricted. Existing instructional materials were not systematically structured to present relevant vocabulary through repeated visual examples. These observations identify a practical mismatch between the demands of classroom communication and the available instructional support. They do not establish that all pupils at the school experience the same difficulties, nor do they independently determine which component of a future intervention might be responsible for changes in communication.

In the present study, Kosaisyarat denotes the sign-vocabulary content incorporated into the learning product, which is called Kosaisyarat. The product consists of a video integrating signed explanations, relevant illustrations, animations, and subtitles. Its subject matter, 'Recognizing Plants,' covers roots, stems, leaves, flowers, and fruits, allowing sign presentations to be linked with familiar curricular concepts. Development involved collaboration with hearme.id

for sign-language interpretation. Signed communication involves coordinated manual and non-manual features; the precise sign-language variety and procedures used to verify linguistic accuracy must be specified by the authors. The educational premise is that pupils may use an accessible vocabulary resource during guided classroom interaction, not that the availability of a video alone necessarily produces interpersonal competence.

Accordingly, this research sought to (1) develop and assess the feasibility of Kosaisyarat through expert appraisal, (2) describe its implementation and pupils' responses in a fourth-grade deaf classroom, and (3) examine within-group pretest–posttest differences in interpersonal communication. The assessment drew on four selected dimensions of DeVito's (2017) framework—openness, empathy, supportiveness, and equality. The study contributes a context-specific account connecting ADDIE-based development, visually accessible curricular material, and an initial assessment of interpersonal communication. It is a one-group design that supports the investigation of change following implementation, but cannot establish a causal effect of the product in isolation.

2. Methods

This study used a research and development (R&D) approach to produce and provisionally evaluate Kosaisyarat, a sign-oriented video learning resource for deaf elementary pupils. The development framework was ADDIE—Analysis, Design, Development, Implementation, and Evaluation (Branch, 2009). ADDIE was applied to organize the work from identifying classroom needs to producing, appraising, and trialing the media. A one-group pretest–posttest component was used to examine whether interpersonal communication scores differed following implementation. These procedures addressed two related but distinct evaluation questions: whether experts judged the product appropriate for instructional use and whether communication assessment scores changed in the participating class. Expert feasibility ratings were not treated as evidence of a causal learning effect.

The research setting was Grade 4.2 at State Special School (SDLB) of Semarang, Indonesia. The small-group trial involved eight deaf pupils in that class. The available records identify their grades and numbers but do not report their ages, sign language backgrounds, or the selection procedure in sufficient detail to determine whether all eligible pupils participated. Accordingly, the sample is described as a small, context-specific class group, without claims of representativeness. The classroom teacher contributed to the selection of the curricular topic and delivered the learning activities in coordination with the researcher. Observations identified comparatively teacher-directed instruction, limited opportunities for peer exchanges, and insufficient media specifically designed for sign-vocabulary practice. These contextual observations informed

product design and should be distinguished from outcome measurements collected after implementation.

The development sequence followed the five ADDIE stages. During the analysis, the research examined pupils' communication needs, classroom practice, and curricular requirements. During Design, the teacher and researcher selected the theme 'Recognizing Plants' and identified content about the definitions and functions of roots, stems, leaves, flowers, and fruits. The materials were planned to combine images, animations, subtitles, and signed explanations. During Development, the visual and written elements were edited into instructional video content, and a sign language interpreter prepared the signed translation in collaboration with hear.me.id. The product was subsequently reviewed by a media expert and a subject-matter expert. The media appraisal considered device or software engineering and visual communication, whereas the material appraisal considered linguistic, content, and presentation aspects. During Implementation, the classroom teacher used the video in learning activities, with support from the researcher. During Evaluation, expert ratings, pupil feedback, observation, and pretest–posttest assessment were examined. Figure 1 summarizes the ADDIE framework.

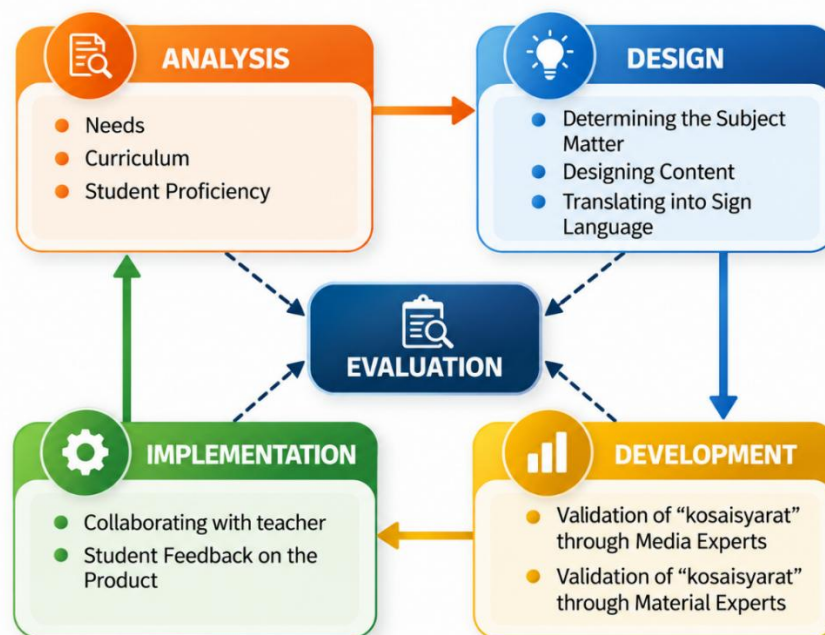


Fig. 1. ADDIE Framework for the Development of Kosaisyarat Learning Media.

Evidence was collected through observations, interviews, documentation, expert validation sheets, student-response questionnaires, and assessments administered before and after classroom implementation. The observational descriptions concern attention to the video, imitation of presented signs, participation in learning, and peer discussion. The pupil-response instrument

contains four reported items assessing enjoyment, motivation, comprehension, and visual quality, each presented as a score and categorical appraisal. For expert appraisal, the manuscript reports the scores assigned to each aspect and the resulting percentage feasibility ratings. However, the scoring scales, maximum values, decision thresholds, and experts' professional qualifications still require documentation. The study also reports collaboration with a sign language interpreter, although the specific sign language system and independent checks of signing accuracy are not specified.

Interpersonal communication was assessed using four dimensions adapted from DeVito's (2017) framework: openness, empathy, supportiveness, and equality. These dimensions were selected by the original researchers as relevant to classroom interaction among participating deaf pupils. The pretest–posttest assessment was intended to capture changes in the composite communication outcome, rather than vocabulary knowledge alone. The available text does not provide item-level indicators, response scales, observation rubrics, rater training, or reliability statistics; consequently, the construct validity of the score should be assessed by the authors before finalizing the findings. Quantitative findings were summarized descriptively, and paired scores were compared using a paired-samples t-test at a two-sided significance level of .05. The reported Shapiro–Wilk results relate to pretest and posttest distributions; whether the distribution of paired differences met the normality assumption remains to be checked. Qualitative descriptions were organized through data reduction, display, and conclusion drawing and verification, without claiming an additional formal coding procedure not described in the source. Because the trial involved eight pupils and no comparison group, statistical differences are interpreted as preliminary within-group associations. Ethical approval, school permission, guardian consent, accessible child assent, and procedures for protecting identifiable student images must be reported from the actual study records before submission.

3. Results

3.1 Development and Expert Validation of Kosaisyarat Learning Media

The needs analysis indicated a mismatch between deaf pupils' communication needs and the learning resources routinely available in Grade 4.2. The classroom activity was primarily led by the teacher, and students had limited opportunities to exchange ideas with one another using signs. The original observations also described the underuse of digital materials and insufficient visual support for structured sign-vocabulary practice. Although the class implemented the Merdeka Curriculum and made adjustments to pupils' learning needs, the resources used did not directly address the observed lack of accessible, repeatable vocabulary presentations. These findings guided the specification of a video-based product, rather than establishing that the

classroom lacked all forms of accessible communication. The focus was on creating a learning resource that could be introduced into existing instruction and accompanied by teacher-guided communication activities.

The design stage began with a discussion between the researcher and the Grade 4.2 classroom teacher about an appropriate curricular topic. The selected theme, 'Recognizing Plants,' was organized around the definitions and functions of five plant parts: roots, stems, leaves, flowers, and fruits. This topic enabled the learning media to present signs in relation to identifiable concepts rather than as an isolated vocabulary list. The design included still images, animated elements, and written subtitles to accompany sign-language interpretation. The article reports attention to color, layout, and alignment of textual material with the corresponding visual explanations. The choice of visual supports is documented as a characteristic of the developed product, not as a separately tested comparison of different video designs.

Production involved arranging the subject matter into a sequence of topics and subtopics and editing video segments that presented the corresponding visual material. The editorial process sought to coordinate text, images, animation, and the sign representations of the learning content. Figure 2 documents the video editing process. This development record is relevant because it distinguishes Kosaisyarat from a general classroom video: the media were produced with signed vocabulary and subject-specific visual references in mind. At the same time, the available report does not describe detailed choices about segment duration, caption readability, video playback speed, or the number of opportunities for repeated viewing. Those features should be documented from the original product or development records if they influenced how pupils engaged with the video.

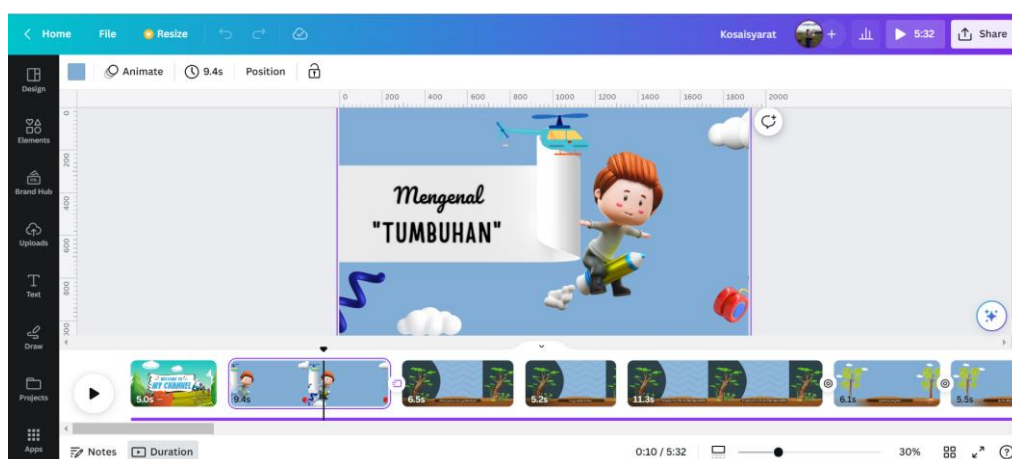


Fig. 2. Video Editing Process.

After the video content had been organized, the learning material was rendered into sign language by a sign language interpreter working in collaboration with hearme.id. The study includes images of the platform and

translation process, which are retained in Figures 3 and 4. This step connected the planned curriculum material with signed representations accessible within the classroom. The images document the stages of production, although the current report does not specify whether linguistic review was conducted separately from subject-matter validation. Thus, the involvement of an interpreter is reported as part of production; it should not automatically be interpreted as evidence that a particular sign-language variety or grammatical standard was independently certified.

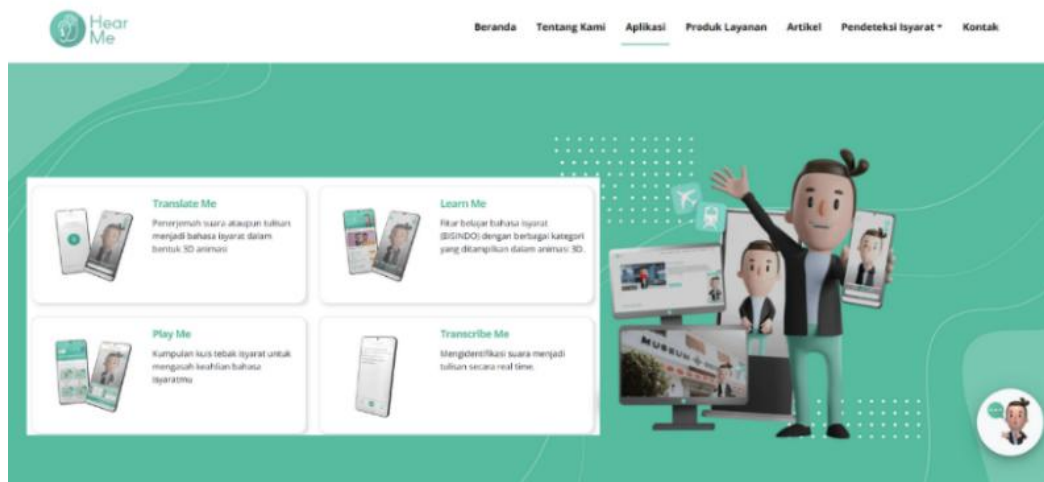


Fig. 3. Hear Me Platform.

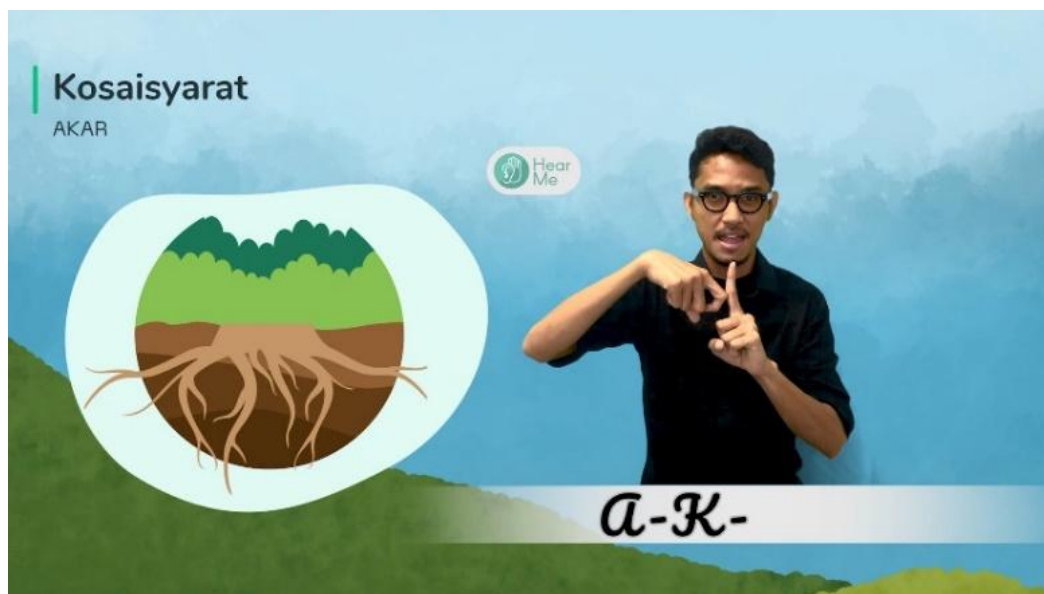


Fig. 4. Sign Language Translation Process.

The developed product was assessed by a media expert and a subject-matter expert before classroom implementation. The media expert evaluated two aspects: device or software engineering and visual communication. The subject-matter expert evaluated linguistic quality, content validity, and presentation

validity. The two assessments address different product properties and should not be combined into an overall claim of student achievement. Tables 1 and 2 retain the individual aspect scores, enabling readers to see which domains contributed to each feasibility rating. Because the source does not report the validators' expertise, the scoring instrument, or its decision rules, the ratings are best described as expert appraisals rather than as independently established psychometric validity.

Table 1.
Media Expert Assessment

No	Assessment Aspect	Score
1	Device Engineering	18
2	Visual Communication	34
Total		52

As presented in Table 1, the device-engineering aspect received 18 points, and visual communication received 34 points, for a total of 52 points. The authors reported a feasibility percentage of 86.6% and classified the product as highly feasible. This result provides descriptive evidence that the expert appraised the media favorably in both assessed domains. Nevertheless, the raw scoring scheme is necessary to interpret the percentage precisely: if 60 was the maximum possible score, 52/60 corresponds to 86.67%, commonly rounded to 86.7%, rather than 86.6%. The reported value has therefore been preserved pending the author's confirmation, rather than being silently recalculated or treated as an exact result.

Table 2.
Subject-Matter Expert Assessment

No	Assessment Aspect	Score
1	Linguistic Validity	23
2	Content Validity	15
3	Presentation Validity	10
Total		48

The subject-matter expert assigned 23 points to linguistic validity, 15 points to content validity, and 10 points to presentation validity, giving a total of 48 (Table 2). The reported feasibility percentage was 96%, again classified as highly feasible. If the assessment used a maximum of 50 points, the reported percentage follows directly from 48/50; this maximum must nevertheless be confirmed. The evaluations suggest that the product met the appraisal criteria applied by the research team, but do not independently demonstrate improvements in interpersonal communication. The finished video was shared at

<https://youtu.be/3BKW7dmw9aE>. The accessibility, continued availability, and consent status of the linked content should be checked before publication.

3.2 Classroom Implementation and Student Responses

Following expert appraisal, Kosaisyarat was implemented with eight deaf pupils in Grade 4.2 at the State Special School (SDLB) of Semarang. The class teacher led the learning activities using the instructional module prepared with the researcher. This arrangement helped situate the product within routine teaching rather than presenting the video as a stand-alone intervention. The reported procedure describes the use of the media as a treatment preceding the posttest, but does not state the number or duration of sessions or the elapsed interval between measurements. Therefore, the source supports a description of what occurred during implementation but not a reproducible statement of exposure intensity. Figure 5 documents the instructional use of the product.



Fig. 5. Kosaisyarat Learning Media during Classroom Implementation.

During instruction, pupils were observed attending closely to the video, imitating presented signs, and showing enthusiasm when engaging with the visual content. These observations provide classroom-level examples of receptive attention and expressive attempts. Imitation of signs is relevant to product delivery because it indicates that pupils responded to the visual language demonstrations. Nevertheless, attention, enjoyment, and imitation are not equivalent to the four interpersonal communication dimensions assessed in the pretest and posttest. They are reported here as implementation observations rather than direct evidence that openness, empathy, supportiveness, or equality improved individually.

The lesson included opportunities for discussion and shared activities after pupils encountered the signed vocabulary. The teacher used the plant content—especially the topic of leaves and their relationship to sunlight—as a starting point for discussing the broader idea of interdependence. This connection was part of the reported instructional context. The classroom account also notes that pupils

were encouraged to communicate about what they had learned rather than interact with the screen alone. Such teacher-guided discussion may have contributed to the learning experience alongside repeated sign presentation. Because the media, teacher instruction, and peer activities occurred together, the design does not enable their independent contributions to be separated analytically.

Pupils' responses were summarized using a four-item questionnaire. Its items addressed whether the video was enjoyable, encouraged learning, was understandable, and offered clear visuals. The response scores are reported in Table 3. These items assess perceived usability and reception of the video rather than interpersonal communication outcomes. Consequently, the questionnaire should be interpreted as a source of implementation feedback and not as an effectiveness test. The distinction matters because a favorable student appraisal and a higher posttest score are different types of evidence and should not be presented as interchangeable measures of the product's impact.

Table 3.
Student Responses to Kosaisyarat Learning Media

No	Statement	Score	Category
1	The video displayed is enjoyable	95	Excellent
2	The video inspires me to learn	85	Excellent
3	The video content is easy to comprehend	95	Excellent
4	The video visuals are clear and of high quality	90	Excellent

The four questionnaire scores were 95 for enjoyment, 85 for learning motivation, 95 for ease of comprehension, and 90 for visual clarity. All four were classified as 'Excellent' using the categories reported by the authors. These item-level findings show consistently favorable responses, although the motivation score was lower than the enjoyment and comprehension scores. The initial report reported an overall average of 91.9; however, the arithmetic mean of the four displayed scores is 91.25 when equal weights are applied. Because the weighting scheme and underlying responses were not available, an aggregate mean is not asserted here. The interpretation is limited to the reported item scores and categories pending verification against the original questionnaire data.

3.3 Pretest–Posttest Differences in Interpersonal Communication

The study used a one-group pretest–posttest comparison to examine pupils' interpersonal communication before and after instruction with Kosaisyarat. The dependent assessment was described as addressing openness, empathy, supportiveness, and equality. A paired-samples t-test was used to evaluate the difference between the two repeated measurements. The analysis is appropriate for a within-pupil comparison when its assumptions are adequately met, but it does not compensate for the absence of a comparison group. The original output

reported Shapiro–Wilk tests on the pretest and posttest scores separately. Table 4 retains these values for transparency while distinguishing them from the assumption check required for a paired difference test.

Table 4.

Normality Tests for Pretest and Posttest Score Distributions

Measurement	n	K–S statistic	K–S p	Shapiro–Wilk W	SW p
Pretest	8	.218	.200*	.896	.269
Posttest	8	.171	.200*	.934	.557

As Table 4 shows, the Shapiro–Wilk statistic was .896 for the pretest ($p = .269$) and .934 for the posttest ($p = .557$), with eight observations in each measurement. Neither test rejected the null hypothesis of normality at the .05 level. These results do not establish that both populations are normally distributed, nor do they verify the relevant assumption for a paired-samples t-test. For that test, the distribution of the eight within-pupil differences should be examined. The reported data do not include the Shapiro–Wilk result or a diagnostic plot for those differences. The inferential result reported below is therefore retained as the authors' output, with that unresolved assumption made explicit.

Table 5.

Paired-Samples t-Test for Interpersonal Communication

Paired comparison statistic	Value
Comparison	Pretest minus posttest
Mean paired difference	–7.50000
SD of differences	5.97614
Standard error	2.11289
95% CI, lower bound	–12.49618
95% CI, upper bound	–2.50382
t (df)	–3.550 (7)
Two-sided p	.009

Table 5 reports a mean paired difference of –7.500 points, defined as pretest minus posttest. The standard deviation of these differences was 5.976, and the standard error was 2.113. The 95% confidence interval ranged from –12.496 to –2.504. The corresponding paired-samples t-test was statistically significant, $t(7) = -3.550$, $p = .009$. Given the direction of the subtraction, the negative mean difference indicates that pupils' posttest communication scores exceeded their pretest scores by an average of 7.50 points. The confidence interval likewise excludes zero, consistent with the reported two-sided significance test. These results describe the measured change within the eight-

pupil group; the manuscript does not report separate means or standard deviations for each measurement.

The inferential result rejects the null hypothesis of no mean difference in the observed pretest–posttest scores under the assumptions of the paired test. It does not test a separate null hypothesis about the causal effect of the media. This distinction is important because scores may change for reasons that occur alongside classroom implementation, including familiarity with the assessment, teacher encouragement, ordinary learning, and the interactive activities accompanying the video. The direction and magnitude of the mean difference are meaningful descriptive findings for the participating group. However, the extent to which the change is attributable specifically to Kosaisyarat cannot be isolated by this design.

Taken together, the results provide three forms of evidence: favorable expert appraisal of the developed product, positive student reception and observed participation during implementation, and a statistically significant within-group difference in interpersonal communication scores. Each addresses a separate research objective and should be interpreted at its appropriate evidentiary level. Expert ratings concern product feasibility; pupil feedback concerns the experience of using the product; and pretest–posttest scores concern measured change over the evaluation period. The findings offer a basis for discussing Kosaisyarat as a potentially useful instructional resource while leaving important questions about measurement quality, durability of improvement, and causal effectiveness open for further investigation.

4. Discussion

4.1 Kosaisyarat, Signed Vocabulary, and Interpersonal Participation

The three sets of results point to the potential educational value of a sign-oriented learning resource while requiring different interpretations. Expert appraisals of 86.6% and 96% concern the judged suitability of the video and its content. Favorable questionnaire scores and observations of pupils imitating signs raise concerns about implementation and engagement. The paired-samples result, $t(7) = -3.550$, $p = .009$, indicates higher measured interpersonal communication scores after implementation. These observations are mutually informative, but they do not form a single scale of 'effectiveness.' In particular, validation percentages do not measure change in communication, and a significant within-group difference does not prove that the media independently produced the improvement.

The instructional rationale for Kosaisyarat is grounded in access to language. Hall (2017) explains why restricted access to an accessible language can have important developmental consequences. However, that literature

should not be interpreted as a diagnosis of language deprivation among the eight pupils studied here. Jarollahi et al. (2025) review evidence on the relationship between sign language exposure and child language development, while Jønsberg et al. (2025) examine controlled language interventions among school-aged deaf and hard-of-hearing children. Together, these studies justify attention to language-rich educational environments and robust outcome measurement. The present product translates this concern into classroom content by linking signs with illustrations and a familiar plant topic; however, it did not independently measure gains in vocabulary acquisition as a mediating variable.

The outcome under investigation is interpersonal communication rather than vocabulary learning alone. DeVito's (2017) framework identifies dimensions of interpersonal behavior; the authors selected openness, empathy, supportiveness, and equality to reflect the classroom objective. These constructs reach beyond the ability to recognize or reproduce signs. For example, expressive vocabulary may assist a pupil in initiating a conversation, but empathy and equality also concern the responsiveness and relational conditions of an interaction. The study's observations of imitation, participation, and shared activities provide plausible contextual links, not direct item-level evidence that each construct increased. Future reporting should therefore show how observed behaviors and test items correspond to each dimension, with appropriate reliability evidence.

Existing scholarships also caution against assuming that materials are sufficient without opportunities to use them socially. Schwab et al. (2019) situate deaf pupils' participation within classroom relationships, while Terleksi et al. (2020) examine peer relationship experiences among deaf and hard-of-hearing learners. La Grutta et al. (2023) also report an association between sign language knowledge and quality of life among deaf adults. However, this evidence from adults should not be taken as proof of improved interpersonal communication among primary-school pupils. Although these studies involve different settings and measures, they help explain why a sign-vocabulary resource may have greater pedagogical relevance when paired with reciprocal exchanges. During the Kosaisyarat lesson, the teacher encouraged pupils to discuss curricular content and respond to one another. This reported organization suggests a connection between accessible input and opportunities for social use, but the lesson's several components were not experimentally separated.

The contribution of the present work should therefore be located at the intersection of product development and classroom implementation. The research describes a specific ADDIE-guided video resource, documents expert evaluations, and reports preliminary differences in scores for eight pupils in an Indonesian special elementary classroom. It does not establish a universally effective intervention or a fundamental shift in the communication ecology of deaf

education. More precisely, it shows how an accessible sign-oriented resource can be embedded in teacher-guided activities in which pupils are encouraged to express, exchange, and negotiate meaning.

This distinction is relevant for the interpretation of the significant test result. With $n = 8$, individual pupil scores may strongly influence estimates; the sample is not sufficient to characterize the wider population of deaf elementary pupils. The study did not report whether the communication instrument was validated for the participants' language use, whether different raters scored behaviors consistently, or whether improvements persisted. Accordingly, positive results can motivate more rigorous testing, but they should not be used to claim general effectiveness, individual improvement in every DeVito dimension, or sustained changes in peer relationships.

4.2 Video-Based Instruction, Teacher Mediation, and Educational Implications

Kosaisyarat combined video, signs, images, animation, subtitles, and teacher-guided classroom activities. Instructional video research suggests that sequencing, signaling, and the coherence of presented information are important design considerations, rather than video delivery itself guaranteeing learning (Fyfield et al., 2022). The cognitive theory of multimedia learning emphasizes the relationship between how information is presented and how learners select, organize, and integrate it (Mayer, 2024). In signed educational material, coordination among moving signs, printed text, and curricular images is especially pertinent. However, the present study did not measure cognitive load, visual attention patterns, or comprehension mechanisms, so an explanation based on multimedia theory remains a plausible interpretation rather than an observed psychological pathway.

Research on video-based materials in deaf education offers useful but differentiated comparisons. Albalhareth and Saleem (2024) evaluated interactive video for mathematics skills, whereas Ishrat et al. (2024) examined sign-based videos and English comprehension. In the Indonesian context, Marliana et al. (2025) investigated sign-language video for initial reading, and Narayana (2024) developed an interactive video for reading activities in an inclusive fourth-grade class. These studies support the feasibility of signed, visually organized media for specific learning tasks. Their outcomes, however, should not be conflated with the present focus on interpersonal communication: a video that improves comprehension or reading does not necessarily change openness, empathy, or supportiveness in peer interactions.

An additional point of comparison concerns the organization of classroom use. Khasawneh (2023) identifies factors influencing the implementation of video resources for deaf pupils, including teachers and learning conditions. Avidov-Ungar et al. (2022) discuss teachers' roles in the organizational integration of

educational technology. In the present study, the classroom teacher delivered instruction, pupils imitated signs, and shared activities followed the video. These features suggest that Kosaisyarat operated as one element of a supported instructional sequence. Claims about the product's independent effect should therefore remain limited: the design cannot determine whether media exposure, teacher guidance, repeated practice, or opportunities for peer interaction accounted for the measured changes.

The favorable pupil responses are relevant for instructional feasibility but deserve equally careful interpretation. Four questionnaire items indicated positive judgments of enjoyment, motivation, comprehension, and image quality, all categorized as Excellent. They do not directly assess accessibility across diverse communication profiles, long-term use, or interpersonal communication competence. The numerical inconsistency in the originally reported average further illustrates why the response instrument and scoring rule should be documented transparently. Similarly, the expert ratings suggest promising product quality but depend on the disclosed evaluation rubrics and the specialists' qualifications. These are correctable reporting issues that matter when a development study is intended to inform practice beyond its original class.

For elementary education, the study suggests a practical approach in which signed curricular content is not treated as an isolated vocabulary drill. Teachers may select familiar subject matter, connect signs to concrete visual references, permit repeated viewing, and provide accessible opportunities for pupils to respond to peers. These are implications derived from the design and classroom observations, not proven effects of particular teaching techniques. The lessons may also inform the design of accessible video resources in special and inclusive education, provided sign-language choice, linguistic review, instructional pacing, and the needs of the learners are considered explicitly. The central contribution is a well-defined product-development case with initial positive feedback and a preliminary within-group signal, not conclusive intervention evidence.

4.3 Limitations and Future Research

Several design and reporting constraints limit the conclusions. The trial involved one class of eight pupils without randomization or a comparison group; therefore, maturation, test familiarity, routine instruction, and teacher mediation cannot be ruled out as alternative explanations. The reported normality analyses addressed pretest and posttest distributions separately, whereas a paired test requires attention to the distribution of individual score differences. With only eight pairs, statistical assumptions and the influence of unusual observations deserve particular scrutiny. The authors should retain the original data and provide assumption checks, individual-level descriptive information in anonymized form, and an appropriate effect-size estimate where feasible.

The available report also does not fully specify the communication assessment rubric, measurement reliability, trial duration, pupils' sign-language backgrounds, or the process for checking linguistic accessibility. These omissions reduce reproducibility and make it difficult to determine which mechanisms could explain the observed score change. Furthermore, results from the response questionnaire and expert appraisals pertain to acceptability and perceived quality, not to the same construct as interpersonal communication. Future studies could compare the resource with existing classroom instruction, use multiple measurement occasions, and examine whether any improvements in signed vocabulary transfer to reciprocal peer exchanges. Importantly, children's privacy and accessible assent must be addressed before the dissemination of classroom images or linked video content.

5. Conclusion

This study developed and evaluated Kosaisyarat, a sign-oriented video learning resource designed to support interpersonal communication among deaf elementary pupils. Using the ADDIE model, the authors produced plant-related instructional content that combined signs, subtitles, images, and animation. Expert appraisal yielded reported feasibility scores of 86.6% for media quality and 96% for subject matter. During implementation with eight fourth-grade pupils, observations and questionnaire scores indicated favorable engagement and reception. A paired-samples t-test showed higher communication scores after the lessons, with a mean increase of 7.50 points ($t(7) = -3.550$, $p = .009$). These outcomes provide initial evidence of product feasibility and within-group improvement, not proof that the media independently caused the difference. The study's contribution is a context-specific model of integrating accessible signed curricular content with teacher-guided opportunities for interpersonal interaction. Before broader claims can be made, the communication instrument, validation rubrics, intervention dose, and ethical procedures require fuller reporting. Further research should include larger and more varied samples, appropriately validated measures, comparison conditions, and follow-up assessments to investigate effectiveness, durability, and transferability.

Declarations

All authors approved the final version of the manuscript and disclosed no competing interests. The study adhered to ethical principles, obtained the required consent, and protected participants' privacy. Grammarly was utilized to improve academic writing and citation accuracy. AI was not used to generate research data. The authors confirmed the manuscript's accuracy and accept full responsibility for its content.

References

- Albalhareth, A. H., & Saleem, S. S. (2024). The effectiveness of an interactive video-based program in developing the skills of comparing and ordering numbers among deaf and hard-of-hearing individuals. *International Journal of Religion*, 5(7), 1085–1093. <https://doi.org/10.61707/4epz9022>
- Avidov-Ungar, O., Shamir-Inbal, T., & Blau, I. (2022). Typology of digital leadership roles tasked with integrating new technologies into teaching: Insights from metaphor analysis. *Journal of Research on Technology in Education*, 54(1), 92–107. <https://doi.org/10.1080/15391523.2020.1809035>
- Beaujard, L., & Perini, M. (2022). The Role and Place of Sign Language in Deaf Youth's Access to Literacy: Contributions of a Cross-Review of ASL-English and LSF-French Research. *Frontiers in Communication*, 7, 810724. <https://doi.org/10.3389/fcomm.2022.810724>
- Branch, R. M. (2009). *Instructional design: The ADDIE approach*. Springer.
- Deng, Q. (2024). The impact of interpersonal relationships on students' academic achievement in primary and secondary schools. *Journal of Education, Humanities and Social Sciences*, 29, 49–55.
- DeVito, J. A. (2017). *The interpersonal communication book*. Pearson Education.
- Fyfield, M., Henderson, M., & Phillips, M. (2022). Improving instructional video design: A systematic review. *Australasian Journal of Educational Technology*, 38(3), 155–183. <https://doi.org/10.14742/ajet.7296>
- Hall, W. C. (2017). What you don't know can hurt you: The risk of language deprivation by impairing sign language development in deaf children. *Maternal and Child Health Journal*, 21(5), 961–965. <https://doi.org/10.1007/s10995-017-2287-y>
- Hardman, G., Kyle, F., Herman, R., & Morgan, G. (2022). Pre-linguistic social communication skills and post-implant language outcomes in deaf children with cochlear implants. *Journal of Communication Disorders*, 100, 106275. <https://doi.org/10.1016/j.jcomdis.2022.106275>
- Hita, I. P. A. D., Lestari, N. A. P., Astuti, N. M. I. P., Fatmawan, A. R., Dewi, M. S. A., Kurniawati, K. L., Isyarotullatifah, I., & Ilmawan, A. W. (2024). The effectiveness of video-based learning media to increase learning motivation on elementary school students. *Jurnal Kajian Pembelajaran Dan Keilmuan*, 8(1), 118–125. <https://doi.org/10.26418/jurnalkpk.v8i1.78702>
- Ishrat, G., Bano, H., & Qureshi, M. S. (2024). Effectiveness of Sign-Based Videos on English Comprehension of Students with Hearing Impairment. *Annals of Human and Social Sciences*, 5(3), 137–150. [https://doi.org/10.35484/ahss.2024\(5-III\)14](https://doi.org/10.35484/ahss.2024(5-III)14)

- Ismiyanti, Y., Permatasari, D., Mayasari, N., & Qoni'ah, M. (2023). The Impact of Video-Based Learning to Cognitive Learning Outcome of Student in Elementary School. *JIP Jurnal Ilmiah PGMI*, 9(1), 51–60. <https://doi.org/10.19109/jip.v9i1.17270>
- Jarollahi, F., Fallahnezhad, T., & Aslibeigi, F. (2025). The effect of sign language on the language development of deaf and hard-of-hearing children: A systematic review. *Journal of Modern Rehabilitation*, 19(4), 346–357. <https://doi.org/10.18502/jmr.v19i4.19770>
- Jønsberg, A. C., Hovland, T., Busch, T., Wie, O. B., & von Koss Torkildsen, J. (2025). Language interventions for school-aged children who are d/Deaf and hard of hearing: A systematic review and meta-analysis. *Journal of Speech, Language, and Hearing Research*, 68(5), 2634–2655. https://doi.org/10.1044/2025_JSLHR-24-00456
- Kashif, M., & Parveen, Z. (2025). The Impacts of Lexical Gaps in Sign Language on The Understanding of Scientific Concepts of Students With Hearing Impairment: Teachers' Perspective From Punjab, Pakistan. *Pakistan Journal of Social Science Review*, 4(4), 921–941. <https://doi.org/10.5281/zenodo.17087318>
- Khasawneh, M. A. S. (2023). The use of video as media in distance learning for deaf students. *Contemporary Educational Technology*, 15(2), Article ep418. <https://doi.org/10.30935/cedtech/13012>
- La Grutta, S., Piombo, M. A., Spicuzza, V., Riolo, M., Fanara, I., Trombini, E., Andrei, F., & Epifanio, M. S. (2023). The relationship between knowing sign language and quality of life among Italian people who are deaf: A cross-sectional study. *Healthcare*, 11(7), 1021. <https://doi.org/10.3390/healthcare11071021>
- Marliana, A., Meiliawati, F., & Sabri. (2025). Development of interactive sign language learning videos to improve initial reading skills. *PIONIR: Jurnal Pendidikan*, 14(3), 560–569. <https://doi.org/10.22373/pjp.v14i3.30037>
- Mayer, R. E. (2024). The past, present, and future of the cognitive theory of multimedia learning. *Educational Psychology Review*, 36(1), 8. <https://doi.org/10.1007/s10648-023-09842-1>
- Miao, J., Chang, J., & Ma, L. (2022). Teacher–student interaction, student–student interaction and social presence: Their impacts on learning engagement in online learning environments. *The Journal of Genetic Psychology*, 183(6), 514–526. <https://doi.org/10.1080/00221325.2022.2094211>
- Narayana, K. K. (2024). Interactive videos to facilitate reading activities in an inclusive class. *Journal of Educational Study*, 4(2), 137–148. <https://jurnal.stkipahsingaraja.ac.id/index.php/joes/article/view/986>

- Paul, P. V., & Yan, P. (2023). The effects of American Sign Language on English reading proficiency. *American Annals of the Deaf*, 167(5), 745–760. <https://doi.org/10.1353/aad.2023.0010>
- Rodrigues, F. M., Rato, J. R., Mineiro, A., & Holmström, I. (2022). Unveiling teachers' beliefs on visual cognition and learning styles of deaf and hard of hearing students: A Portuguese-Swedish study. *Plos One*, 17(2), e0263216. <https://doi.org/10.1371/journal.pone.0263216>
- Schwab, S., Wimberger, T., & Mamas, C. (2019). Fostering social participation in inclusive classrooms of students who are deaf. *International Journal of Disability, Development and Education*, 66(3), 325–342. <https://doi.org/10.1080/1034912X.2018.1562158>
- Sehyr, Z. S., & Emmorey, K. (2022). Contribution of lexical quality and sign language variables to reading comprehension. *The Journal of Deaf Studies and Deaf Education*, 27(4), 355–372. <https://doi.org/10.1093/deafed/enac018>
- Terlektsi, E., Kreppner, J., Mahon, M., Worsfold, S., & Kennedy, C. R. (2020). Peer relationship experiences of deaf and hard-of-hearing adolescents. *The Journal of Deaf Studies and Deaf Education*, 25(2), 153–166. <https://doi.org/10.1093/deafed/enz048>
- Thierfelder, P., Tang, G., & Li, J. (2024). The acquisition of Hong Kong Sign Language in deaf and hard-of-hearing children: A longitudinal study of sign language development in a bimodal bilingual co-enrollment programme. *Deafness & Education International*, 26(1), 6–36. <https://doi.org/10.1080/14643154.2023.2292860>
- Yang, J., Deng, Y., & Wang, Y. (2023). Reciprocal associations among social–emotional competence, interpersonal relationships and academic achievements in primary school. *Behavioral Sciences*, 13(11), 922. <https://doi.org/10.3390/bs13110922>
- Zhang, D., Ke, S., Yang, J., & Anglin-Jaffe, H. (2024). Sign language in d/Deaf students' spoken/written language development: A research synthesis and meta-analysis of cross-linguistic correlation coefficients. *Review of Education*, 12(3), Article e70016. <https://doi.org/10.1002/rev3.70016>
- Zheng, F. (2022). Fostering students' well-being: The mediating role of teacher interpersonal behavior and student-teacher relationships. *Frontiers in Psychology*, 12, 796728. <https://doi.org/10.3389/fpsyg.2021.796728>