

The Effect of the Tooth-Brushing Demonstration Method on the Knowledge and Skills of Students with Intellectual Disabilities at the State Special School in Samarinda City

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Abstract

Background: Oral health problems remain an important concern among students with intellectual disabilities, including students at the Samarinda State Special Education School, where 26 of 28 high-school students examined in 2025 (92.85%) had dental caries. Purpose: This study analyzed the effect of a toothbrushing demonstration method using a dental phantom on knowledge and toothbrushing skills among high-school students with intellectual disabilities. Methods: A pre-experimental one-group pretest-posttest design was conducted with 20 students from grades X–XII selected through total sampling. The intervention was delivered three times over three days, followed by a final posttest. Knowledge was measured using a 25-item questionnaire and skills using an observation checklist. Data were analyzed descriptively and with the Wilcoxon signed-rank test. Results: Before intervention, 70.0% of students had good knowledge, while 15.0% had sufficient and 15.0% had poor knowledge. At the final posttest, 75.0% reached the very good category, 20.0% good, and 5.0% sufficient, with no students remaining in the poor category. For skills, 65.0% required guidance before intervention; after intervention, 60.0% were categorized as very good, 20.0% good, 10.0% sufficient, and 10.0% still required guidance. The Wilcoxon test showed $p=0.000$ for both knowledge and skills. Conclusions: The toothbrushing demonstration using a dental phantom was associated with significant improvements in knowledge and toothbrushing skills among the participating students.

Keywords

Dental health; Demonstration; Intellectual disability; Knowledge; Toothbrushing skills



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INTRODUCTION

Oral health is an important component of general health, but maintaining oral hygiene can be more difficult for people with intellectual and developmental disabilities. Limitations in adaptive functioning may affect self-care, including the ability to perform toothbrushing correctly and consistently. Evidence summarized in the thesis indicates that children with

intellectual and developmental disabilities experience a higher burden of oral-health problems and may face barriers to appropriate oral-health services (Mehta et al., 2024; Wilson et al., 2024).

At the local level, the need for oral-health promotion is particularly evident at the Samarinda State Special Education School. Data from the 2025 oral-health examination conducted by UPTD Puskesmas Temindung showed that 26 of 28 high-school students examined (92.85%) had dental caries. The high proportion of caries across elementary, junior-high, and high-school levels indicates a substantial oral-health problem among students who may require adapted and repeated instruction to develop self-care skills.

Toothbrushing education should therefore be delivered through methods that match the learning characteristics of students with intellectual disabilities. Demonstration provides a concrete learning experience because students can observe a procedure, imitate the movements, and practice the procedure directly. The use of a dental phantom can make the shape of teeth, direction of brushing movements, sequence of brushing, and areas that need cleaning more visible. Dewi et al. (2024) describe demonstration as an educational approach that can make procedures easier to observe and understand, while Eldarita and Amanullah (2021) reported an association between toothbrushing guidance and oral-hygiene outcomes among children with intellectual disabilities.

Previous studies have also explored different oral-health education approaches for children with intellectual disabilities. Solekhawati (2022) examined animated-video education, while other studies identified the value of direct guidance and practical learning. The present study focuses specifically on a demonstration method using a dental phantom and evaluates two outcomes simultaneously: knowledge and toothbrushing skills. This focus is relevant because knowledge alone does not necessarily indicate that a student can perform the procedure correctly.

Based on the research problem stated in the thesis—whether the demonstration method influences knowledge and toothbrushing skills among students with intellectual disabilities—the study aimed to analyze changes in knowledge and skills before and after the intervention among high-school students at the Samarinda State Special Education School.

METHODS

This study used a pre-experimental one-group pretest-posttest design. The intervention consisted of health education on proper toothbrushing delivered through demonstration using a dental phantom. The study was conducted at the Samarinda State Special Education School from 30 June to 2 July 2026. The accessible population comprised students with intellectual disabilities in grades X–XII, and all eligible students were included through total sampling, resulting in 20 respondents.

Before the intervention, respondents completed a pretest measuring toothbrushing knowledge and were observed performing toothbrushing skills. The demonstration was

delivered three times over three days. The material included the importance of oral hygiene, the benefits and recommended timing of toothbrushing, the required tools and materials, and the correct sequence and technique of toothbrushing. The researcher was assisted by one enumerator and two teachers, who helped with communication, questionnaire completion, demonstration, and skill observation. A final posttest was conducted after the intervention sequence.

Knowledge was measured using a 25-item true/false questionnaire. The operational categories were good (80–100%), sufficient (60–79%), and poor (<60%). Toothbrushing skill was measured using a 10-step observation checklist covering preparation, brushing different tooth surfaces, cleaning the tongue, rinsing, and cleaning and storing the toothbrush. The instrument development and testing described in the thesis indicated that the knowledge items were valid, with item *r*-values ranging from 0.501 to 0.619, exceeding the reported *r*-table value of 0.4438. Reliability was assessed using Cronbach's Alpha, with 0.70 used as the minimum criterion.

Data were processed through editing, scoring, tabulation, data entry, and cleaning. Univariate analysis was used to describe respondent characteristics and the distributions of knowledge and skills before and after the intervention. Because the dependent variables were paired ordinal data, the Wilcoxon signed-rank test was used to assess differences between pretest and final posttest results, with $\alpha=0.05$. Ethical procedures included ethical clearance, informed consent, anonymity, and confidentiality.

RESULTS AND DISCUSSION

Results

The results are presented according to the research questions: respondent characteristics; knowledge before and after the demonstration; toothbrushing skills before and after the demonstration; and the statistical effect of the intervention on both outcomes.

Table 1. Respondent characteristics (N=20)

Characteristic	n	%
12–15 years	0	0.0
15–18 years	19	95.0
18–21 years	1	5.0
Male	13	65.0
Female	7	35.0
Mild intellectual disability	0	0.0
Moderate intellectual disability	13	65.0
Severe intellectual disability	7	35.0

Source: Research data, 2026.

Most respondents were 15–18 years old (95.0%), male (65.0%), and classified as having moderate intellectual disability (65.0%). One respondent (5.0%) was 18–21 years old, seven (35.0%) were female, and seven (35.0%) had severe intellectual disability. No respondent in the study was classified as having mild intellectual disability.

Table 2. Toothbrushing knowledge before and after the intervention

Knowledge category	Pretest n	Pretest %	Posttest n	Posttest %
Very good	0	0.0	15	75.0
Good	14	70.0	4	20.0
Sufficient	3	15.0	1	5.0
Poor	3	15.0	0	0.0
Total	20	100.0	20	100.0

Source: Research data, 2026.

Before the intervention, 14 respondents (70.0%) had good knowledge, three (15.0%) had sufficient knowledge, and three (15.0%) had poor knowledge. After the demonstration intervention, 15 respondents (75.0%) reached the very good category, four (20.0%) were good, and one (5.0%) was sufficient. No respondent remained in the poor category.

Table 3. Toothbrushing skills before and after the intervention

Skill category	Pretest n	Pretest %	Posttest n	Posttest %
Very good	0	0.0	12	60.0
Good	2	10.0	4	20.0
Sufficient	5	25.0	2	10.0
Needs guidance	13	65.0	2	10.0
Total	20	100.0	20	100.0

Source: Research data, 2026.

Before intervention, most respondents (65.0%) were categorized as needing guidance, while 25.0% were sufficient and 10.0% were good. At the final posttest, 60.0% were categorized as very good, 20.0% as good, 10.0% as sufficient, and 10.0% still required guidance. Thus, the distribution shifted substantially toward better skill categories after the demonstration.

Table 4. Wilcoxon analysis of knowledge and toothbrushing skills

Outcome	Comparison	Wilcoxon p-value	Interpretation ($\alpha=0.05$)
Knowledge	Pretest vs. final posttest	0.000	Significant difference
Toothbrushing skills	Pretest vs. final posttest	0.000	Significant difference

Source: Research data, 2026.

The Wilcoxon signed-rank test produced $p=0.000$ for knowledge and $p=0.000$ for toothbrushing skills. Both values were below $\alpha=0.05$, indicating statistically significant differences between the pretest and final posttest measurements for the two outcomes. These results directly answer the research question: the demonstration intervention was followed by significant improvements in both toothbrushing knowledge and skills in the participating students.

Discussion

The respondent profile is important when interpreting the intervention. Almost all participants were middle adolescents, and most had moderate intellectual disability. The thesis discussion emphasizes that students with moderate intellectual disability can follow simple instructions and imitate demonstrated movements, while students with more severe limitations may require more intensive support and repetition. This is consistent with the broader literature describing the need to adapt health education and self-care training to the learning characteristics of students with intellectual disabilities (Adillah & Yusuf, 2022; Hidayah & Prasetyo, 2024). The present results show that intellectual disability did not prevent participation in a structured, concrete learning activity.

The first research outcome concerns knowledge. The proportion in the very good category increased from 0% at pretest to 75% at final posttest, while the poor category fell from 15% to 0%. The Wilcoxon p -value of 0.000 indicates a statistically significant pretest-posttest difference. The likely mechanism identified in the thesis is the concrete nature of the demonstration: students could observe the shape of the teeth, the direction of brushing movements, and the sequence of brushing rather than relying only on verbal explanations. The learning process involved seeing, listening, imitating, and practicing, which made the information more concrete and easier to remember.

This finding is consistent with the literature cited in the thesis. Demonstration-based oral-health education has been described as useful because a procedure can be observed directly and then practiced by the learner (Dewi et al., 2024). Studies of oral-health education using visual or practical media have likewise reported improvements in toothbrushing-related knowledge or ability among children and adolescents (Solekhawati, 2022; Putri, 2024; Widiyantari, 2024). The present study extends that evidence to a school-based group of high-school students with intellectual disabilities by evaluating both cognitive and practical outcomes in the same intervention.

The second research outcome concerns toothbrushing skills. At baseline, 13 of 20 respondents (65.0%) still required guidance. Following the intervention, 12 respondents (60.0%) reached the very good category and only two (10.0%) remained in the guidance-needed category. The Wilcoxon result of $p=0.000$ indicates a statistically significant change. The thesis attributes this improvement to direct practice, repetition, and assistance from the researcher, enumerator, and teachers. The dental phantom provided a visible model of tooth surfaces and brushing

directions, after which students could imitate the demonstrated movements.

The skill findings are also compatible with prior work emphasizing direct guidance for toothbrushing among children with intellectual disabilities. Eldarita and Amanullah (2021) reported the relevance of toothbrushing guidance for oral-hygiene status in children with intellectual disabilities. The thesis also discusses prior studies using demonstration and repeated practice, including studies showing improvement in toothbrushing ability after practical education. In this study, the large shift from 'needs guidance' to 'very good' suggests that repeated, concrete practice may be particularly useful when the learning objective is procedural rather than purely informational.

The simultaneous improvement in knowledge and skills is important for health-promotion practice. A student may be able to answer questions about toothbrushing without being able to perform all steps correctly. Conversely, a student may imitate a movement without understanding why it is necessary. The intervention in this study connected explanation with direct modeling and practice. This combination is consistent with the conceptual framework used in the thesis and with the need for individualized, concrete, and repeated learning experiences for students with intellectual disabilities.

Nevertheless, the findings should be interpreted within the study design. There was no control group, the sample consisted of only 20 students from one special education school, and the study period was short. The thesis also reports practical limitations in managing students and differences in communication ability that required adjustment in delivering the material. Therefore, the statistically significant pretest-posttest differences demonstrate change within the study group, but they do not by themselves establish that the demonstration method would produce the same magnitude of change in other schools or populations. Future research could use a controlled design, larger samples, longer follow-up, and direct oral-health indicators such as plaque or caries-related outcomes.

CONCLUSION

The toothbrushing demonstration method using a dental phantom was associated with significant improvements in both knowledge and toothbrushing skills among 20 high-school students with intellectual disabilities at the Samarinda State Special Education School. Knowledge shifted from predominantly good at baseline to predominantly very good after the intervention, while toothbrushing skills shifted from predominantly requiring guidance to predominantly very good. The Wilcoxon signed-rank test yielded $p=0.000$ for both outcomes. The findings support the use of concrete, visual, repeated, and practice-oriented oral-health education in special education settings. Schools and health services may consider incorporating repeated toothbrushing demonstrations into routine health-promotion activities, with continued support from teachers and parents.

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