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Implementation of a Modified STAD Model to Enhance Learning Independence Deaf Students in Special Junior High School Students

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Abstract

This study aimed to enhance the learning independence of deaf students by implementing the Student Teams Achievement Division (STAD) cooperative learning model, modified to align with the students' visual communication characteristics. A mixed-methods approach with an embedded case study design was employed, involving nine eighth-grade deaf students. The intervention was conducted over four sessions, utilizing visual instructions, rotating group roles, visual learning media, and symbolic rewards. The study spanned four weeks, with one session held each week, lasting approximately 80 minutes per session. Quantitative and qualitative data were collected concurrently to evaluate changes in the students' learning independence. The results demonstrated improvements across indicators such as initiative, self-regulation, responsibility, perseverance, and self-evaluation. Most students shifted from passive behavior to becoming more active and independent. These findings indicate that the modified STAD model is effective in enhancing the learning independence of deaf students and serves as a cooperative learning alternative better suited to their visual communication characteristics.

Keywords Deaf Students; Cooperative Learning; Learning Independence; STAD

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1. INTRODUCTION

Every child, including those with hearing impairments or who are deaf, has the potential to thrive when provided with educational services tailored to their needs (Murdiyah et al., 2020)(Setiaruf, 2021). Deaf children face challenges in receiving auditory stimuli, which directly impacts their language development, communication, and social interaction (Yeni et al., 2023)(Nanor et al., 2024). They tend to rely on visual cues to understand information, so the learning process needs to be designed around visual experiences and direct interaction (Rahawarin et al., 2026)(Siswosuharjo et al., 2026). Communication barriers often cause deaf students to be less active in learning activities and more dependent on teachers (Jasmin et al., 2025). This results in low levels of independent learning and social participation in the classroom (Yulita, 2025)(Casandra et al., 2025) .

Based on observations at SLB Bina Sejahtera, deaf students in grade VIII showed passive tendencies in learning. They often waited for instructions from the teacher, did not immediately start tasks without guidance, and showed little initiative in group work. This low level of learning independence was evident in the students' dependence on the teacher's help and their lack of responsibility in completing tasks. This condition shows that learning is still one-way and has not fully activated the collaborative potential of students. This problem requires the application of a learning model that can stimulate active

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participation, social interaction, and a sense of shared responsibility.

This issue necessitates the implementation of a learning model capable of stimulating active participation, social interaction, and a sense of shared responsibility. One approach proven effective in developing students' social and cognitive skills is the Student Teams Achievement Division (STAD) cooperative learning model (Matradewi, 2024)(Nur, 2023). The STAD model emphasizes learning in small, heterogeneous groups, where each member bears both individual and collective responsibility for the group's success (Saputra, 2026). Through teamwork, discussion, and joint evaluation, students are encouraged to engage actively and assist one another in grasping concepts (Setiawan & Fauzi, 2023).

However, applying the STAD model to students who are deaf or hard of hearing requires modifications, given that limitations in verbal communication are a primary characteristic of this group. Verbal components within the STAD model—such as the delivery of instructions or group discussions—must be replaced with visual media and simplified text (Luviana et al., 2024). Consequently, this study focuses on adapting the STAD model to align with the visual communication characteristics of deaf students (Jaime & Reyes-rojas, 2024). This adaptation involves the use of visual instructions (such as illustrated step-by-step guides and charts outlining group roles), rotating group responsibilities, visual media (e.g., videos with captions), and a symbolic reward system, such as star stickers and a scoreboard (Halder et al., 2024); (Saridewi et al., 2023).

These modifications aim not only to adjust the learning media but also to establish a collaborative structure that fosters both participation and individual accountability. It is expected that this modified STAD model will create an inclusive and engaging learning experience, while simultaneously cultivating the learning autonomy of deaf students through a collaborative and iterative process (Religia & Volume, 2024). Social interaction is a crucial factor in cognitive development; collaborative learning enables students with communication barriers to benefit from peer support, or "scaffolding." (Tambun, 2023)(Rahawarin et al., 2026)

The Student Teams Achievement Division (STAD) is a cooperative learning model that emphasizes peer interaction, shared responsibility, and active participation through group-based learning. Previous studies indicate that STAD can improve learning outcomes, student activity, motivation, and social interaction by providing opportunities for students to work collaboratively and support one another (Agung et al., 2025; Marufi & Makkasau, 2025; Maula et al., 2026; Nor et al., 2023; Rahman, 2025; Wiratama et al., 2022). However, its implementation for deaf students requires greater attention to communication and learning characteristics. Deaf students experience limitations in receiving auditory information, which may affect language development, communication, and social interaction, making visual communication an important channel for accessing learning information (Casandra et al., 2025; Yulita, 2025). Therefore, STAD should not merely be transferred from general education settings but adapted through visual instructions, simple written information, visual learning media, and structured group interaction. In this study, these adaptations include step-by-step visual instructions, rotating group roles, captioned learning videos, and symbolic rewards through star stickers and scoreboards (Marwah & Lestari, 2023; Yuliastuti et al., 2023). Such adaptations are intended to reduce communication barriers while creating opportunities for deaf students to participate, interact, and assume responsibility within their groups. Learning independence is a fundamental aspect of 21st-century education. as an individual's capacity for self-regulation, emotional control, goal setting, and the independent evaluation of one's own progress. Meanwhile learning independence is characterized by a student's ability to take initiative, assume responsibility for tasks, and possess the self-confidence to navigate learning challenges. For deaf students, this capacity plays a crucial role in helping them adapt to environments where communication is predominantly auditory.

This study aims to describe the implementation of a modified Student Teams-Achievement Divisions (STAD) cooperative learning model—adapted for visual and social contexts—and to analyze its impact on enhancing the learning autonomy of eighth-grade deaf students at SLB Bina Sejahtera. It

is hoped that the findings of this research will contribute to the development of more inclusive and effective instructional strategies for learners with communication impairments.

2. METHODS

This study uses a mixed methods approach, which combines quantitative and qualitative data to obtain a more comprehensive understanding of the effectiveness of applying a modified STAD cooperative learning model on improving the learning independence of deaf students. This approach allows researchers to not only measure changes in independence scores through test instruments, but also to observe changes in student behavior and social interactions during the learning process. This research design uses an embedded mixed-method design, in which qualitative data serves to reinforce and explain quantitative data. Thus, the analysis of the results is not limited to numbers, but also to the meaning behind changes in the learning behavior of deaf students. The research was conducted at SLB Bina Sejahtera, a special education institution that serves students with various disabilities, including deafness. This school was chosen because it has a conducive learning environment and teachers who are experienced in handling children with special needs. In addition, this school has also implemented several visual-based learning innovations, making it suitable for the application of the modified STAD model. The research activities were carried out over four weeks, covering the planning stage, implementation of learning interventions, and evaluation of results. The research was conducted over four weeks, consisting of four sessions, with one session conducted each week. Each session lasted approximately 80 minutes.

The participants were nine eighth-grade deaf students aged 13–15 years who were selected through purposive sampling. The inclusion criteria were severe hearing impairment (70–90 dB), use of Indonesian Sign Language (Bisindo) in daily communication, ability to participate in basic academic learning, particularly thematic learning and social activities, and variation in participation and social interaction. Because nine students could not be distributed equally across groups, they were organized into two heterogeneous learning groups consisting of five and four students, respectively. Heterogeneous grouping considered students' academic ability, communication ability, and level of participation so that students with different characteristics could support one another during group activities. The four core STAD roles consist of leader, note-taker, observer, and presenter were rotated across sessions. In the group consisting of five students, the additional member participated in all group activities and assumed one of the four roles in subsequent activities to ensure that all students had opportunities to experience different responsibilities. The classroom teacher served as the primary facilitator and instructor, while the researcher coordinated the intervention, data collection, and observation. Instructions were delivered primarily through Bisindo, supplemented by simple written text, pictures, symbols, demonstrations, and captioned videos to minimize dependence on auditory communication.

The quantitative instrument consisted of a 25-item Learning Independence Questionnaire measuring five indicators: initiative, self-regulation, responsibility, perseverance, and self-evaluation. A 20-item Behavioral Observation Sheet was also used to document students' independent learning behaviors during the intervention. Both instruments had previously undergone expert validation involving two Special Education lecturers and one experienced special education teacher, with Aiken's V values ranging from 0.83 to 1.00 and ICC values of 0.921 for the questionnaire and 0.894 for the observation sheet. Quantitative data were analyzed descriptively and through the Sign Test because the study involved paired observations from a small sample. Qualitative data from observations, field notes, and the teacher interview were analyzed thematically through data reduction, coding, theme identification, interpretation, and conclusion drawing. The behavioral observations were conducted by one observer throughout the intervention sessions; therefore, inter-rater agreement could not be calculated. This single-observer arrangement is acknowledged as a methodological limitation and may

introduce potential observer-related subjectivity in the assessment of students' behavioral changes. Because the qualitative interview involved only one classroom teacher, the qualitative triangulation was limited; therefore, the interview findings were interpreted as supporting evidence rather than independent confirmation of the quantitative results. Ethical procedures included obtaining informed consent from the students' parents or legal guardians and permission from the school before data collection.

Research Instruments

The instruments used in this study consisted of quantitative and qualitative instruments. Quantitative Instruments: The quantitative instruments included a Learning Independence Questionnaire and a Behavioral Observation Sheet. The Learning Independence Questionnaire employed a four-point Likert scale (always, often, rarely, and never) and was developed based on five indicators of learning independence: initiative, self-regulation, responsibility, perseverance, and self-evaluation. The Behavioral Observation Sheet was designed to assess the frequency and quality of students' independent learning behaviors during classroom activities, including task initiation, active participation, responsibility, persistence, and self-evaluation (Murjani, 2025; Mansur & Salim, 2024). Qualitative Instruments: The qualitative instruments consisted of semi-structured interview guidelines and field notes. Semi-structured interviews were conducted with the classroom teacher to obtain in-depth information regarding changes in students' learning independence and the effectiveness of the modified STAD cooperative learning model. Field notes were used to document classroom events, learning dynamics, students' responses, and social interactions observed throughout the implementation of the intervention (Hamdani & Damayanti, 2023; Bagus et al., 2022).

Before data collection, all research instruments were validated through expert judgment involving two lecturers specializing in Special Education and one senior special education teacher with more than ten years of experience in teaching students with hearing impairments. The experts evaluated the instruments in terms of content relevance, clarity of language, suitability of the indicators, and appropriateness for the characteristics of deaf students before the instruments were implemented in the study. Quantitative data were analyzed using descriptive statistics to summarize students' learning independence scores before and after the implementation of the modified STAD cooperative learning model. To determine whether there was a significant difference in students' learning independence before and after the intervention, the Sign Test was employed because the study involved a small sample and paired observations. The quantitative findings were presented in tables showing changes in the average scores for each indicator and the results of the Sign Test. Qualitative data were analyzed using thematic analysis, which involved data reduction, coding, theme identification, data interpretation, and conclusion drawing to explain changes in students' learning behaviors and social interactions during the intervention. Finally, the quantitative and qualitative findings were integrated through data triangulation to enhance the credibility and trustworthiness of the research findings. The quantitative results provided empirical evidence of improvements in students' learning independence, while the qualitative findings offered a comprehensive explanation of how these behavioral changes occurred during the implementation of the modified STAD cooperative learning model.

3. FINDINGS AND DISCUSSIONS

Findings

This study was conducted during four meetings with deaf students in grade VIII at SLB Bina Sejahtera. The learning activities used the Student Teams Achievement Division (STAD) model, which had been modified to suit the visual communication characteristics of the students. Each meeting lasted for two hours with learning themes related to daily life, such as Maintaining Personal and School Environment Hygiene, Working Together in Groups, and Respecting Differences Around Us. At the

beginning of the intervention, most students seemed to have difficulty understanding the group work system. They often waited for instructions from the teacher and did not show initiative in completing tasks. However, through the use of visual instructions in the form of step-by-step pictures, simple texts, and short videos with texts, the students gradually began to understand the structure of the activities.

Instrument Validity and Reliability

Table 1. Results of Instrument Validity and Reliability

Instrument	Number of Items	Aiken's V Range	ICC Value	Interpretation
Learning Independence Questionnaire	25	0.83–1.00	0.921	Valid and high reliability
Behavioral Observation Sheet	20	0.83–1.00	0.894	Valid and high reliability

Based on Table 1, the reliability results showed that the Learning Independence Questionnaire obtained an ICC value of 0.921, while the Behavioral Observation Sheet obtained an ICC value of 0.894. Both instruments demonstrated high reliability, indicating good consistency for measuring students' learning independence.

Results of Pretest and Posttest

To evaluate the effectiveness of the modified Student Teams Achievement Division (STAD) cooperative learning model, students' learning independence was measured before (pretest) and after (posttest) the intervention using the Learning Independence Questionnaire.

Table 2. Pretest and Posstest Scores of Studens Learning Independence

Student	Pretest	Posttest	Difference
S1	52	78	+26
S2	55	82	+27
S3	48	75	+27
S4	58	84	+26
S5	50	79	+29
S6	54	81	+27
S7	47	74	+27
S8	56	83	+27
S9	51	62	+11
Mean	**52.33**	**77.56**	**25.22**

Table 2 presents the pretest and posttest scores of students' learning independence before and after the implementation of the modified Student Teams Achievement Division (STAD) cooperative learning model. The results show that all students obtained higher posttest scores than pretest scores. The mean pretest score increased from **52.33 to 77.56,** with a mean difference of **25.22** points. These findings indicate that the implementation of the modified Student Teams Achievement Division (STAD) cooperative learning model contributed to improving the learning independence of deaf students.

Teachers acted as facilitators who provided initial guidance and monitored the progress of group work. At the second meeting, students began to show active involvement in their respective groups. Communication between students increased, and social interaction appeared more dynamic than at the first meeting. Symbolic reward systems such as star stickers and scoreboards also encouraged students to participate more actively. The most significant changes occurred in the third and fourth meetings.

Eight of the nine students were able to work independently, understand their respective roles, and show responsibility in completing group tasks. One student still needed the support of his groupmates to understand the written instructions, but still showed positive progress in terms of courage and participation. Teachers reported that the classroom atmosphere became more lively, conducive, and full of enthusiasm for learning. The learning process took place gradually and showed noticeable progress at each meeting. An overview of the dynamics of behavioral changes in students can be seen in Table 3 below:

Table 3. Development of Students' Learning Independence During Four Modified STAD Intervention Sessions

Session	Development Description	Dominant Indicators
1	Students were still passive and dependent on the teacher and had not yet understood the structure of group activities. Self-regulation remained low, and initiative was not yet apparent.	Initiative and self-regulation
2	Students began to understand group roles and responsibilities and started to communicate actively with group members.	Initiative and responsibility
3	Most groups began to work independently. Interaction among students increased, and students began to take initiative without teacher guidance. Perseverance and responsibility became stronger.	Initiative, perseverance, and responsibility
4	Eight students were able to work independently, make decisions together, and present group results, while one student still required guidance. Self-evaluation and self-confidence increased.	Self-evaluation

Based on the results in Table 3 above, the observation shows the results of changes in student learning independence after the implementation of the modified STAD cooperative learning model. These changes were observed through five main indicators, namely learning initiative, self-regulation, responsibility, perseverance, and self-evaluation. In terms of learning initiative, it was observed that students who were initially passive and waited for instructions from the teacher began to show independence by boldly doing tasks without being asked and actively asking questions to their friends. This shows an increase in courage and participation in the learning process.

In terms of self-management, students who were initially unable to manage their time and learning equipment began to be able to prepare tools, follow schedules, and adjust to group work steps. This condition indicates an increase in students' discipline and self-management skills. Positive changes were also seen in the responsibility indicator. Before the intervention, students tended to leave tasks unfinished and were very dependent on the teacher's help. After the intervention, students became more responsible, completed group tasks thoroughly, and showed concern by helping friends who were experiencing difficulties.

In terms of perseverance, students who initially gave up easily when faced with difficulties began to show persistence and determination. They were also able to ask for help in an appropriate manner when encountering obstacles, which indicates progress in their ability to face learning challenges. Meanwhile, in terms of self-evaluation, students who were previously unable to assess their own work began to be able to correct mistakes and improve the results of group work. This change indicates an increase in self-reflection and control over the learning process.

Overall, the table shows that the application of the modified STAD cooperative learning model has a positive impact on increasing the learning independence of deaf students, both academically and socio-emotionally. Students become more active, responsible, disciplined, persistent, and able to reflect on their learning outcomes.To clarify the changes that occurred, Table 4 below summarizes the results of observations and assessments of students' learning independence development based on five main indicators.

Table 4. Changes in Learning Independence Based on Five Indicators

Indicator	Initial Condition	After Intervention	Observed Change
Initiative	Students waited for teacher instructions and tended to be passive in completing tasks.	Students began working without being asked and actively asked questions of their peers.	Increased courage and participation in learning activities.
Self-regulation	Students experienced difficulties in managing their time and learning materials.	Students began preparing learning materials, following schedules, and adapting to group work steps.	Discipline and self-regulation skills developed.
Responsibility	Students tended to leave tasks unfinished and wait for teacher assistance.	Students began taking responsibility for completing group tasks and helping peers who experienced difficulties.	A stronger sense of responsibility for group tasks developed.
Perseverance	Students easily gave up when facing difficulties.	Students became more persistent in completing tasks and were able to ask for help appropriately when encountering obstacles.	Persistence in facing difficulties developed.
Self-evaluation	Students were not yet able to assess their own work.	Students began to correct mistakes and improve group work.	Self-reflection and control of the learning process developed.

Based on the results in Table 4 above, it can be seen results of changes in student learning independence after the implementation of the modified STAD cooperative learning model. For self-regulation, students initially experienced difficulties in managing their learning time and preparing the materials needed for activities. Following the intervention, they increasingly prepared their learning materials independently, followed the activity schedule, and adapted to the steps of group work. These changes indicated the development of greater discipline and self-regulation during the learning process. In the responsibility indicator, students initially tended to leave tasks unfinished and wait for assistance from the teacher. After the intervention, they demonstrated greater responsibility by completing assigned group tasks and assisting peers who experienced difficulties. This reflected a stronger willingness to take responsibility for both individual and group learning activities.

Regarding perseverance, students initially tended to give up when encountering difficulties. After participating in the modified STAD activities, they became more persistent in completing tasks and were increasingly able to seek appropriate assistance when obstacles arose. This indicated improved persistence in dealing with learning difficulties. Finally, in self-evaluation, students initially had difficulty assessing the quality of their own work. After the intervention, they began identifying and correcting mistakes and making improvements to their group work. Overall, the observations showed that the modified STAD intervention was accompanied by improvements in students' initiative, self-regulation, responsibility, perseverance, and self-evaluation, suggesting a gradual shift from teacher-dependent participation toward more independent involvement in the learning process.

Discussion

The findings of this study demonstrate that the modified Student Teams Achievement Division (STAD) cooperative learning model provides meaningful contributions to improving the learning independence of deaf students. Rather than merely functioning as a cooperative learning strategy, the modified STAD model creates learning experiences that encourage students to become more responsible, actively participate in group activities, and regulate their own learning processes. These findings indicate that adapting cooperative learning to the visual communication characteristics of deaf

students can enhance not only academic engagement but also the development of independent learning behaviors. Similar findings have been reported by Rahawarin et al. (2026) and Persada et al. (2025), who emphasized that cooperative learning encourages students to become active participants through shared responsibility and positive interdependence among group members.

The observed improvement can be explained by the interaction between the cooperative structure of STAD and the visual adaptations introduced in this study. The first mechanism was the redistribution of responsibility through rotating group roles. Rather than allowing students to remain dependent on the teacher or a more active peer, the rotation of roles required students to experience different responsibilities during group activities. This structure provided repeated opportunities to initiate actions, complete assigned tasks, and contribute to group outcomes. The second mechanism was visual scaffolding (Agustini, 2019). Instructions delivered through Bisindo, pictures, symbols, written prompts, demonstrations, and captioned media reduced reliance on auditory information and provided students with accessible cues for completing tasks (Syaifuddin & Rahardjanto, 2026). The third mechanism was peer support. Heterogeneous group work enabled students to observe, imitate, clarify, and support one another during learning activities (Nor et al., 2023). The fourth mechanism was symbolic reinforcement through star stickers and group scores, which provided immediate and visible feedback regarding participation and progress. Together, these mechanisms may explain why the students' development was not limited to classroom participation but extended to responsibility, perseverance, and self-evaluation (Suantara, 2019).

This mechanism is consistent with Self-Determination Theory, particularly the psychological needs of autonomy, competence, and relatedness. The modified STAD structure provided opportunities for autonomy because students were progressively encouraged to initiate and complete tasks without waiting for direct teacher instruction (Adnyana, 2020). Competence was supported through manageable group responsibilities, visual guidance, and opportunities to correct mistakes, while relatedness was strengthened through peer cooperation and mutual assistance. These conditions can support students' willingness to participate actively and assume responsibility for their learning. The findings therefore extend the application of Self-Determination Theory to deaf learners by showing how cooperative learning structures can be adapted to communication needs while simultaneously supporting independent learning behaviors (Alsuhaibani & Albuzaid, 2025; Cheng et al., 2026). The findings can also be interpreted through Vygotsky's Zone of Proximal Development, because peer interaction provided social scaffolding through which students could perform tasks that were initially difficult to complete independently (McLeod, 2024; Wibowo et al., 2025). In this study, the gradual reduction of teacher dependence observed across the sessions suggests that repeated peer-supported practice may have helped students move toward more independent task performance.

The findings are broadly consistent with previous research showing that STAD and cooperative learning can support student engagement, learning independence, and responsibility. (Sihombing et al., 2024) reported that STAD-based cooperative learning increased learning independence among middle school students, with 16.67%. of students showing improvement, alongside improvements in motivation and learning outcomes. Similarly, (Ariningsih et al., 2023) found a significant improvement in students' learning independence following the implementation of STAD-based classical guidance using a one-group pretest-posttest design. Other previous esearch also indicates that STAD can strengthen student activity, responsibility, collaboration, and learning outcomes (Syuhada et al., 2025; Guntoro et al., 2024; Yulita, 2025). The present study extends these findings to a more specific population by demonstrating similar patterns of improvement among deaf junior high school students, for whom communication accessibility represents an additional instructional consideration.

However, the findings can not interpreted as evidence that STAD is universally effective across all student outcomes or special education contexts. Other evidence from studies involving students with special educational needs has produced different results. (Marwiyati, 2019) study of STAD and social acceptance among students with specific learning difficulties, for example, found no statistically

significant improvement in overall peer social acceptance, although some reciprocal friendship outcomes improved. This contrasting result is useful because it suggests that the effects of STAD may depend on the outcome being measured, the characteristics of the learners, and the way the model is implemented. Likewise, the present study did not examine academic achievement or social acceptance as primary outcomes; its focus was learning independence. Therefore, the positive changes observed here should be understood specifically in relation to independent learning behaviors rather than generalized to all educational outcomes. The difference also reinforces the possibility that adaptation to learners' communication characteristics is an important contextual factor when cooperative learning is implemented in special education.

From a theoretical perspective, these findings extend cooperative learning theory by demonstrating that structured interdependence can be used not only to facilitate academic learning but also to develop behaviors associated with learning independence. The results also support the proposition that autonomy does not necessarily require individual learning without social interaction. In this study, independence developed within a structured collaborative environment in which students were still supported by peers and teachers but were gradually given greater responsibility for initiating, managing, and evaluating their own learning. This provides a more contextualized understanding of learning independence among deaf students, where independence can emerge through accessible social interaction rather than through the removal of assistance (Noor & Sriyanto, 2026). The gradual behavioral changes observed across four sessions also suggest that teachers should provide repeated opportunities for students to practice the same independent behaviors rather than expecting immediate autonomy after a single learning activity (Saridewi et al., 2023; Wagino et al., 2025).

Several limitations should be considered when interpreting these findings. First, the study involved only nine students from one special school, which substantially limits the generalizability of the findings to other deaf learners, schools, or educational contexts. Second, the study used a one-group pretest-posttest design without a control or comparison group. Consequently, the observed improvement cannot be attributed exclusively to the modified STAD intervention because maturation, classroom routines, teacher attention, repeated measurement, or other contextual factors may also have contributed to the changes. These limitations indicate that the findings should be interpreted as preliminary evidence of positive change rather than definitive evidence of the causal effectiveness of the modified STAD model (Masitoh, 2019).

The findings also have important implications for special education practice. Teachers should recognize that learning independence among deaf students can be enhanced through cooperative learning environments that emphasize visual communication, structured collaboration, and active student participation. Rather than relying predominantly on teacher-centered instruction, educators should provide learning experiences that encourage students to interact, solve problems collaboratively, and assume responsibility for their own learning. Furthermore, the modified STAD model offers a practical instructional alternative that can be implemented in special schools to promote both academic participation and social development among students with hearing impairments.

4. CONCLUSION

This study concludes that the modified Student Teams Achievement Division (STAD) cooperative learning model effectively improved the learning independence of eighth-grade deaf students. The intervention was implemented over four learning sessions involving nine deaf students, resulting in improvements across the five indicators of learning independence, namely initiative, self-regulation, responsibility, perseverance, and self-evaluation. The effectiveness of the modified STAD model was supported by several instructional adaptations, including visual instructions, rotating group roles, visual learning media, symbolic rewards, and active teacher facilitation. These modifications enabled students to participate more actively in collaborative learning activities and gradually develop greater

responsibility for their own learning. The findings indicate that adapting cooperative learning to the visual communication characteristics of deaf students contributes not only to increased learning independence but also to improved classroom participation and peer interaction.

This study contributes to the development of adaptive cooperative learning strategies in special education by demonstrating that a visually modified STAD model can serve as an effective instructional approach for deaf students. Future studies are recommended to involve larger samples, multiple special schools, and longer intervention periods to examine the long-term effectiveness and wider applicability of the modified STAD model in different special education settings.

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