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**Optimizing the Metacognitive Ability of Intelligent Deaf Children Through Innovative Learning**

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| **Article Information:**Received Revised Accepted  | **ABSTRACT** |
| This research aims to optimize the metacognitive abilities of intelligent deaf children through innovative learning. This study uses a qualitative approach with a focus on literature analysis and learning practices. The results of the study show that deaf children have special challenges in the development of metacognitive skills, which has an impact on their learning ability. Innovative learning, including vocational learning, effective sign language teaching, and the implementation of the Multiple Intelligences theory, has been shown to improve the metacognitive abilities of deaf children. Strategies such as the use of visual aids, intensive non-verbal communication techniques, and individualized learning approaches were found to be effective. This research also reveals the importance of the role of teachers in developing special skills to teach deaf children. In conclusion, the optimization of the metacognitive abilities of intelligent deaf children can be achieved through the application of innovative learning methods tailored to their specific needs.**Keywords**:  *metacognitive, innovative learning, Deaf children* |

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# INTRODUCTION

This journal discusses intervention strategies for deaf/deaf (D/HH) children, which can be linked to metacognitive approaches and innovative learning. Metacognitive, or awareness and understanding of one's thought process, is particularly relevant in this context. D/HH children need to develop metacognitive awareness of their own communication and learning strategies. Early and ongoing interventions emphasized in journals can include techniques to improve metacognitive skills, helping D/HH children to better understand and manage their learning process. Innovative learning also plays an important role, especially given the complexity and variation in hearing loss. Tailored approaches and support from specialized professionals can involve innovative learning methods such as the use of adaptive technologies, visual strategies, and multisensory approaches. By combining metacognitive strategies and innovative learning, educators can more effectively support the communication, language, academic, and social/emotional development of D/HH children, enabling them to become more independent and successful learners.(Bakken & Obiakor, 2018)

# RESEARCH METHODOLOGY

This study uses a qualitative descriptive method to understand the phenomenon of optimizing the metacognitive abilities of intelligent deaf children through innovative learning. The qualitative approach was chosen to explore a deep understanding of the behavior, perception, motivation, and actions of the research subjects holistically in the context of learning for deaf children.

Data analysis uses data reduction techniques, data presentation, and conclusion drawn/verification. To ensure the validity of the data, this study uses source triangulation, which is to re-examine the data obtained through several sources to produce conclusions agreed upon by various related parties.

Through this methodology, the research aims to produce a comprehensive understanding of strategies for optimizing the metacognitive abilities of intelligent deaf children through innovative learning, which can make a significant contribution to the development of special education methods for deaf children.

# RESULT AND DISCUSSION

## A. Definition of Deaf

"The word "deaf" is often confusing and inconsistent. Deaf people are defined as "individuals with severe to very severe bilateral, mixed, or sensorineural hearing loss." According to the World Health Organization (WHO) media center, the most common and accurate definition of deafness is that used in the field of audiology: "A person who cannot hear as well as a person with normal hearing—a hearing threshold of 25 dB or better in both ears—is said to have hearing loss."(Felicite, 2021)

Many experts lament the excessive use of the word "deaf", arguing that almost no one is completely deaf, as there is usually still residual hearing. Other experts use the term "hearing loss," which is used to describe people with any degree of hearing loss, from mild to very severe, including those who are deaf and hard of hearing. However, many people who are deaf or hard of hearing "Hard of hearing" is a term that refers to people who experience mild to severe hearing loss. They usually speak and can benefit from cochlear implants.(Felicite, 2021)

A deaf person is someone whose hearing is impaired to such an extent that it prevents the understanding of speech through the ear alone, with or without the use of hearing aids.(Felicite, 2021) A person who is hard of hearing is someone whose hearing is impaired to a degree that makes it difficult, but does not impede, the understanding of speech through the ear alone, with or without hearing aids."

Deafness can be interpreted as hearing loss, where children who experience deafness are experiencing problems in the loss or reduction of hearing ability. Children who can be said to be deaf if they are unable or less able to hear. According to him, deaf people can be divided into two categories, namely deaf and hard of hearing. Deafness is a condition in which a person is completely unable to hear due to the loss of hearing function in their ears. Meanwhile, hearing loss is a condition in which a person who has damage to his or her hearing organs but can still function to hear even with or without hearing aids. (Khairun Nisa et al., 2018)

## B. Characteristics of Deaf Children

Deafness is a term that indicates a condition of dysfunction of a child's hearing organs or ears, this condition causes them to have distinctive characteristics, different from normal children in general, some characteristics of deaf children from "physical, linguistic, intellectual and socio-emotional aspects. (Wahid, 2020)

Based on some of the characteristics of deaf children above, it is further explained as follows:

1) Physical aspect

            The way he walks is stiff and slightly bent, which is caused by problems with the balance organs in the ears, short and irregular breathing because he cannot hear well so that the child cannot regulate breathing properly, and the way of vision is somewhat sloppy this is because vision is one of the most dominant senses that show curiosity. (Khairun Nisa et al., 2018)

2) Language aspect

Poor in vocabulary; It is difficult to interpret words that contain expressions or idiomatic and the grammar is not regular Intellectual.(Nofiaturrahmah & Kudus, 2018)

His intellectual abilities are normal, but due to limitations in communication and language, his intellectual development becomes slow, this is also the cause of the delay in his academic development.

4) Social-emotional

Often feeling suspicious and suspicious, this attitude occurs due to hearing dysfunction so that they cannot understand what others are talking about so they are easily suspicious; Often being aggressive; Often impulsive (actions that are not based on careful planning and are always worried and indecisive. (Wahid, 2020)

## C. Metacognition plays an important role in the learning process

Dreading comprehension. This study aims to assess the metacognitive skills of deaf students using tests adapted into sign language. *The Scale of Reading Consciousness (ESCOLA) test* was modified for Spanish sign language and applied to 23 deaf students, compared to 289 hearing students. (Alvarado et al., 2012)

The results showed that deaf students had lower knowledge of metacognitive strategies compared to their listener peers at the same level of education. Specifically, high school deaf students showed a level of metacognitive knowledge equivalent to elementary school students who could hear. Further analysis revealed that the largest deficit in primary school deaf students lies in the evaluation process, while secondary school deaf students show weaknesses in the self-monitoring and regulation process.

These findings support the hypothesis that lower reading rates in the deaf population are related to lack of knowledge and the use of metacognitive strategies. The study highlights the importance of specific interventions to improve metacognitive skills in deaf students, with a focus on planning, monitoring, and evaluation strategies, as a way to improve their reading and writing skills.(Alvarado et al., 2012)

## D. Innovation Learning

### 1. Vocational Learning

Vocational learning is an important component of inclusive education, especially for deaf students. The program aims to equip students with practical skills that can support their independence and readiness to face the world of work. One effective form of vocational learning is a cosmetology program with a focus on haircutting skills.(Ana Rafikayati & Muhammad Nurrohman Jauhari, 2021)

 This program is usually carried out periodically, for example twice a month, and is led by expert instructors from outside the school assisted by Special Accompanying Teachers (GPK). The learning material includes an introduction to barber tools, techniques for using the correct tools, and various trimming methods using scissors, razors, and shavers.

The learning methods used generally involve *direct learning* and demonstrations, which are very much in line with the characteristics of deaf students as visual learners. The learning plan is prepared based on the Competency Standards and Basic Competencies of the Special Education Curriculum from the Ministry of Education and Culture, which is then outlined in the Learning Implementation Plan (RPP).

The implementation of learning consists of preliminary, core, and closing activities. Students are given the opportunity to do hands-on practice under the guidance of instructors and GPK. Evaluations are conducted to assess students' work and provide constructive feedback.(Ana Rafikayati & Muhammad Nurrohman Jauhari, 2021)

This vocational program not only teaches technical skills, but also helps develop soft skills such as discipline, responsibility, and the ability to work together. Thus, vocational learning is an effective means of preparing deaf students for a more independent and productive future.

### 2. Sign Language Learning

Teaching sign language effectively, teachers need specific strategies that meet the unique learning needs of their students. Teaching sign language is not a simple task. Deaf students have unique learning needs and are different from students in general. Therefore, teachers need to develop and implement specific strategies designed to meet these needs. These strategies may involve the use of visual aids, more intensive non-verbal communication techniques, or a more individualized approach to learning.(Bintoro et al., 2023)

The results showed that teachers used two main strategies to teach sign language to deaf students, including:

1. Speech method, which consists of spoken language and sign language.
2. Manual method, which consists only of sign language.

The speech method combines spoken language with signs, which can be helpful for students who still have hearing left over or who are able to read lips. This method can also help students in integration with the general public. Meanwhile, the manual method focuses entirely on sign language, which may be more effective for students who are completely unable to hear. The choice of this method depends on the needs and abilities of each student.

Both of these methods are frequently used and contribute to students' proficiency as well as their active participation in classroom learning. Regular use of these two methods not only improves students' sign language skills, but also encourages their active participation in the learning process. This shows that the right strategy can increase student engagement and create a more dynamic and interactive learning environment.

Teaching sign language poses significant challenges for teachers, especially with regard to their proficiency in the language. Teachers not only need to master the subject matter, but also must be proficient in sign language itself. This may require special training and constant practice for teachers. This challenge also demonstrates the importance of continuous professional development for teachers in specialized schools.(Bintoro et al., 2023)

This indicates that teachers need special skills to ensure their students can understand the material. Teachers need to develop a specific set of skills, including the ability to convey information through sign language, read and respond to students' body language, and adjust teaching methods to ensure comprehension of the material. It may also involve the ability to create and use effective visual aids.

Teaching deaf students in special schools can be complex, as highlighted by various studies. This complexity may involve a variety of factors, including the diversity of students' hearing levels, differences in sign language skills, challenges in classroom management, and the need to adapt standard curricula to meet students' specific needs. The research mentioned in this quote shows that this complexity is widely recognized in the educational community, emphasizing the importance of ongoing research and the development of best practices in this field.(Bintoro et al., 2023)

Fourteen non-sign language users and 10 Native American sign language (ASL) users who were deaf participated in a 2O H15O positron emission tomography study in which they generated an action pantomime or ASL verb in response to images of manipulateable tools and objects. To produce a pantomime, the participants were instructed to 'show how you would use the object'. For verb generation, sign language users are asked to 'generate verbs related to objects'. The object for this condition was chosen to provoke a handling verb that resembles a pantomime.(Emmorey et al., 2011)

### 3. Implementation of Multiple Intelligences-Based Learning.

Multiple Intelligences (MI)-based learning has become a significant approach in inclusive education, especially for deaf students. Recent research on the application of MI in this context shows several important patterns and challenges. Educators generally begin the process by conducting an initial assessment to identify the specific abilities and needs of deaf students, which then becomes the basis for the preparation of learning plans.(Matien, 2003)

In its implementation, the learning strategies implemented tend to focus on the development of visual-spatial, physical-kinesthetic, interpersonal, and naturalist intelligence. This approach allows for better accommodation to the learning styles and unique needs of deaf students. However, the study also revealed challenges in implementation, especially in the aspects of assessment formulation, preparation of learning plans, implementation, and evaluation based on MI.

To overcome these barriers, educators often take initiatives such as consulting experts, attending trainings and seminars, simplifying the language used in instruction, and integrating local sign language into the learning process. Learning evaluation is usually carried out through process assessment and post-test.

These findings indicate that although MI-based learning has begun to be applied in inclusive education for deaf students, there is still a need for ongoing support and professional development for educators. This is important to optimize the implementation of the MI approach and improve the quality of inclusive education for deaf students.(Matien, 2003)

Young children are faced with the dual task of spatial perception, memory, and spatial transformation on the one hand, and the processing of grammatical structures on the other. Young deaf children, unlike their hearing peers, must acquire non-verbal spatial capacity that serves as a prerequisite for the use of spatial linguistics. These two quotes emphasize the importance of visual-spatial cognition in sign language development in deaf children, suggesting that this ability is a critical component in sign language acquisition.(Quinto-Pozos et al., 2013)

### 4. Tutorial and Perception Features

1. The Importance of Accessibility Features

An in-depth discussion of accessibility features in the tutorial. The reason why deaf students emphasize the importance of these features.(Gehret & Elliot, 2023)

2. Implications for the CTML Principle

An analysis of how these findings relate to at least one principle *of the Cognitive Theory of Multimedia Learning (CTML).*Discussion on whether these CTML principles apply the same or different to the deaf student population.

3. Improvement Suggestions from Students

A summary of suggestions given by deaf students to improve the tutorial. An analysis of how these suggestions might relate to other CTML principles.

4. Implications for E-learning Design

Discussion on how these findings may affect the future design of e-learning materials for Deaf students. Recommendations for e-learning content developers and educators working with deaf student populations.(Gehret & Elliot, 2023)

### 5. PASS (Planning, Attention, Simultaneous, and Successive) Model

The PASS model was introduced as a modern view of intelligence based on the conceptualization of human brain function described as "the most frequently cited Soviet scientist in U.S., British, and Canadian psychology journals, developing a model consisting of three functional units of the brain. (Naglieri et al., 1994)

1) The First Functional Unit: *Attention*

The first unit focuses on cortical attention and alertness. Its main function is to maintain the right level of alertness and focused attention. It includes a wide range of activities, from simple onboarding responses to complex activities that require selective attention. These tests typically present a multidimensional stimulus array that requires the subject to selectively pay attention to one dimension of a complex stimulus while ignoring other dimensions that may be more prominent.

*5.*Second Functional Unit: *Simultaneous and Successive* Processes

The second unit deals with the acquisition, storage, and retrieval of knowledge through simultaneous and sequential cognitive processes.Simultaneous Process: This is involved when the stimulus must be integrated into groups where each element of the task relates to every other element. An example of a task that measures simultaneous processing is the Progressive Matrices Sequential Process: This is necessary when stimuli must be integrated into a specific linear sequence, where each element only corresponds to the next element. Examples of tasks include word recall or digit span forward.

Both of these processes can be applied in different modalities (auditory, visual, kinesthetic) and can involve different types of stimuli (verbal, non-verbal). They can also be applied during direct perception, information retention, and at a higher conceptual level.

6. Third Functional Unit: Planning

The third unit deals with the planning process. This includes the regulation and verification of activities, the generation of plans, the monitoring of the success of actions, and the development of new plans when needed. Planning involves the ability to ask new questions, solve problems, and conduct self-monitoring. Tasks used to identify planning include trail making, visual search, written composition, and pictorial.

The results of this study have the potential to provide valuable insights into the cognitive structure of deaf students and how this may be different or similar to students who can hear. This information can have important implications for the development of more effective teaching and assessment strategies for deaf students.

Overall, the application of the PASS model to deaf students represents an effort to understand their cognition within a comprehensive and theoretical framework. This can help bridge the gap between general cognitive theory and a specific understanding of cognitive function in deaf populations.

### 6. STS (Science, Technology, and Society)

*The Science, Technology, and Society*(STS) approach is an interdisciplinary learning strategy that integrates science with aspects of technology and society. This literature review examines the effectiveness of the STS approach in improving student achievement, particularly deaf students and students with hearing impairments, in five identified science learning domains:

1. Application and Connection Domains: The STS approach allows students to connect science concepts to their daily lives. This is especially important for deaf students who often have difficulty understanding abstract concepts. Through STS, students can apply science knowledge in real-life situations, improving their understanding.(Development, 2018)
2. Attitude Domain: STS has been shown to increase students' interest and positive attitudes towards science. For deaf students, it can help overcome psychological barriers to learning science and boost their confidence.
3. Creativity Domain: The STS approach encourages creative and innovative thinking. Deaf students can develop problem-solving and critical thinking skills through hands-on activities that are an integral part of this approach.
4. Process Domain: STS emphasizes the development of science process skills. Through experiments and practical activities, deaf students can improve observation, classification, and data analysis skills.
5. Concept Domain: The STS approach helps students understand science concepts more deeply. For deaf students, this means not only memorizing facts, but also understanding the basic principles of science and their relationship to technology and society.

The STS approach has significant potential to improve deaf students' achievement in all five domains of science learning. However, further research is needed to specifically measure the impact of STS on deaf students, taking into account their unique characteristics and learning needs.

## E. Comprehensive Psychological Evaluation for Deaf and Hard of Hearing Children.

A psychological evaluation for deaf and hard of hearing children is a complex and multidimensional process. It aims to provide a thorough understanding of the child's strengths and learning needs, as well as identify areas that require specialized support. Unlike standard evaluations, assessments for this population require a customized approach that is sensitive to their unique communication and language development (Whitaker & Thomas-Presswood, 2017)

The evaluation process should follow the guidelines set by the Individuals with Disabilities Educational Act (IDEA), which emphasizes the importance of comprehensive assessment using a variety of tools and strategies. This includes gathering information from multiple sources, including parents, teachers, and the child himself. Evaluators should consider the child's mode of communication, whether it is American Sign Language (ASL), spoken language, or other methods of communication.

Evaluation should include assessments across multiple domains, including cognitive, academic, social-emotional and behavioral. The Building Blocks of Learning (BBL) model can be used as a framework for understanding learning issues in the classroom. It is also important to consider the possibility of additional disabilities, given the high prevalence of comorbid conditions in this population.(Whitaker & Thomas-Presswood, 2017)

 Given the diversity in the deaf and hard of hearing population, evaluators should be aware of potential biases in standardized tests and be prepared to make necessary adaptations. However, any adaptations must be done carefully to maintain the validity and reliability of the test.

This evaluation should be conducted by a psychologist who has specialized training in assessing deaf and hard-of-hearing children. The results of the evaluation should be presented in a clear and easy-to-understand written report, with specific and actionable recommendations to support the child's educational development.

With this comprehensive and tailored approach, psychological evaluations can be a valuable tool in designing effective educational programs and supporting the optimal development of deaf and hard-of-hearing children. (Whitaker & Thomas-Presswood, 2017)

**CONCLUSION**

This study shows that the optimization of metacognitive abilities of bright deaf children can be achieved through the application of innovative learning methods tailored to their specific needs. The results of the analysis reveal the crucial role of metacognitive abilities in the cognitive and academic development of bright deaf children, emphasizing the importance of focusing specifically on developing these abilities in the learning process. Innovative learning, which includes vocational approaches, effective sign language teaching and implementation of Multiple Intelligences theory, proved effective in improving metacognitive skills. Key strategies such as the use of visual aids, non-verbal communication techniques intensive, and individualized learning approaches play an important role in optimizing these abilities. The role of teachers is vital in developing and implementing innovative learning methods, emphasizing the need for specialized training for educators. A holistic approach involving collaboration between educators, parents and special education experts is needed to create a supportive learning environment. This research highlights the importance of adapting learning methods to meet the specific needs of bright deaf children, enabling them to reach their full potential in academics and everyday life. However, further research is needed to develop and evaluate the effectiveness of specific innovative learning programs in the long term, in order to continuously improve the quality of education for bright deaf children.

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