



Development of a Game-Based Physical Activity Learning Model for Children with Intellectual Disabilities at SD Negeri 30 Palembang

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| Abstract |
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| <p>Objectives. This study aims to describe the implementation process of a physical activity-based learning model through games for children with special needs (intellectual disabilities). It focuses on the learning materials, game-based activities, and instructional media used to enhance their motor skills. The objective is to improve students’ physical activity competencies and engagement through adaptive and inclusive teaching strategies.</p> <p>Materials and Methods. The research employed a development method using the ADDIE model (Analyze, Design, Development, Implementation, Evaluation). The learning activities were implemented at SD Negeri 30 Palembang, involving students with special needs. Data collection was conducted through observation, expert validation, and student response documentation. The effectiveness of the program was assessed based on observed improvements in motivation, motor skills, and social interaction.</p> <p>Results. The results indicate that the use of simple ball games significantly enhanced students’ interest and participation in physical education activities. The model successfully supported cognitive, emotional, and social development. Instructional media and adapted game formats proved effective in promoting engagement and learning outcomes for students with intellectual disabilities.</p> <p>Conclusions. The implementation of game-based physical activity learning models in inclusive education settings can optimally improve motivation and motor skill development in children with special needs. Structured and playful approaches enhance the quality of physical education and support the holistic growth of students with intellectual disabilities.</p> |
| <p>Keywords: learning model, ball games, motor skills, children with special needs (CWSN)</p> |

Introduction

Education in Indonesia is intended for all citizens, regardless of age, background, or physical and mental condition (Iswana, 2019). Inclusive education ensures that individuals with disabilities, including children with intellectual disabilities, have equal rights to access quality learning experiences across all educational levels. According to Bandi Delphie (as cited in Setyaningsih, 2023), proper education can help children with special needs become independent and reduce their reliance on others. However, teaching students with intellectual disabilities requires specialized methods and learning models that support their functional development.

The developmental trajectory of children with disabilities differs significantly from their peers, and they often require tailored support in areas such as physical, cognitive, social, emotional, and adaptive behaviors (Verhoef et al., 2021). As unique individuals, children with intellectual disabilities possess strengths that can be developed through well-designed education services (Snell et al., 2009). The goal of special education is to optimize their potential so they can live independently and adapt effectively to their environment (Martínez Mora & Gil Zambrano, 2024).

In the context of physical education (PE), students with special needs—especially those with intellectual disabilities—require adaptive approaches that accommodate their conditions. Adaptive physical education refers to a customized program of physical activities modified to ensure safe, successful, and satisfying participation for individuals with disabilities (Van Munster et al., 2019). According to (Civelek & Uyanık, 2023) most children with intellectual disabilities exhibit low mobility and physical performance, highlighting the critical role of movement-based programs in their overall development.

At SD Negeri 30 Palembang, many students with special needs show low motivation and interest in physical education. During PE classes, these students often disengage, preferring to isolate themselves rather than actively participate in structured activities. Furthermore, traditional, unvaried sports games often fail to capture their interest, leading to a monotonous and ineffective learning experience. These issues stem largely from the lack of a suitable instructional model that reflects the unique needs of these learners.

To address this challenge, the researcher designed a modified ball game titled *Masukkan Bola ke Keranjang* (Put the Ball into the Basket), specifically aimed at engaging students with intellectual disabilities in meaningful physical activity. This game-based learning approach is intended to foster self-confidence, improve motor skills, and encourage

social interaction among students. As (Tyilo, 2022) states, play-based learning supports children's growth by promoting exploration, attention, self-regulation, and physical mastery.

Through initial observations, the need for a more engaging, motivating, and varied instructional model became evident. Therefore, this study seeks to develop a game-based physical activity learning model tailored for students with intellectual disabilities at SD Negeri 30 Palembang. The goal is to produce a practical model that can serve as a reference for teachers to deliver adaptive, effective, and inclusive physical education.

Materials and Methods

Study Participants.

The participants involved in the development and validation of the model included three expert validators: a university lecturer specializing in adaptive physical education, a media learning expert, and a special education teacher. The field implementation involved students with intellectual disabilities at SD Negeri 30 Palembang who participated in the product trial.

Study organization.

This study employed a research and development (R&D) approach using the ADDIE model, which consists of five systematic stages: Analyze, Design, Develop, Implement, and Evaluate. The goal was to create a game-based physical activity learning model tailored for students with intellectual disabilities (Tunagrahita) at SD Negeri 30 Palembang. The study focused on developing a practical learning product rather than testing statistical effectiveness.

The development process followed the ADDIE model, beginning with an analysis of students' low engagement in physical education. A game-based learning model was then designed, featuring three simple and adaptive games. After expert validation and revision, the model was implemented with students with intellectual disabilities at SD Negeri 30 Palembang. Finally, its effectiveness was evaluated based on improvements in motor skills and student participation.

Statistical analysis.

Validation instruments included expert questionnaires assessing game suitability, clarity, instructional value, and media design. Each item was rated using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The instruments were grouped into three categories: content expert, media expert, and field practitioner. Evaluation indicators included game objectives, benefits, delivery methods, and child-centered relevance.

The data collected in this study were analyzed using a percentage-based scoring method to assess the validity and practicality of the developed learning model. Each expert's

evaluation was converted into scores, which were then compared against the maximum possible score to determine the percentage of validity. The resulting scores were interpreted using a five-level classification system: a score between 90% and 100% was categorized as highly valid and indicated that the product required no revisions; scores between 75% and 89% were considered valid and suggested only minor adjustments; scores in the range of 65% to 74% were fairly valid and required more substantial revisions; those falling between 55% and 64% were deemed less valid and required significant modifications; while any score below 54% indicated that the product was not valid and needed a complete redesign. This analysis ensured that the product met appropriate standards before implementation in the field.

Results

This study aimed to develop a game-based physical activity learning model for students with intellectual disabilities (Tunagrahita) at SD Negeri 30 Palembang using the ADDIE development framework, which consists of five stages: Analyze, Design, Develop, Implement, and Evaluate.

Analyse Stage.

An initial needs analysis was conducted through direct observation and interviews with physical education teachers at SD Negeri 30 Palembang. The findings revealed that students with intellectual disabilities demonstrated low motivation, limited participation, and a general disinterest in physical education activities. The existing teaching models were deemed ineffective in engaging these students, largely due to a lack of variation and insufficient alignment with their learning characteristics. Teachers also confirmed that although games were occasionally included in the lessons, students showed minimal interest. Based on these findings, the researcher concluded that a more engaging and adaptive game-based learning model was needed to support student motivation and motor development.

Design Stage.

The proposed model consisted of structured physical activities in the form of three modified ball games: Zigzag Ball, Figure-8 Ball, and Tarkam Throw. Each game was designed to stimulate gross and fine motor skills as well as promote social interaction. The instructional media included colourful plastic balls, cones, ropes, baskets, and plastic bottles. The game steps were clearly illustrated and compiled into a teacher's guidebook. The model emphasized clear instructions, visual aids, and tasks that could be easily understood and enjoyed by students with intellectual disabilities.

Development Stage.

The design was validated by three experts: an adaptive physical education lecturer, a school PE teacher, and a media design expert. The results of expert validation were as follows:

- a) Adaptive PE Expert: Scored 53 out of 55, resulting in a validity percentage of 96.36% (Very Valid).
- b) PE Teacher for Special Needs: Scored 54 out of 60, with a validity percentage of 90.00% (Very Valid).
- c) Media Expert: Scored 53 out of 60, yielding a validity percentage of 88.33% (Valid).

The average validity score across all validators was 91.56%, classifying the product as Very Valid and suitable for implementation with only minor revisions suggested by the media expert (e.g., enhancing the visual design and adding attractive colors and layouts).

Implementation Stage.

The model was implemented with fifth- and sixth-grade students with intellectual disabilities at SD Negeri 30 Palembang. The learning sessions were divided into three phases: warm-up (simple stretching or mini-games), core activities (executing the game models), and cool-down (light movements). Students participated enthusiastically in all three games:

- a) Zig-Zag Ball: Students navigated cones in a zig-zag pattern to place colored balls into matching baskets.
- b) Figure-8 Ball: Students followed a figure-eight path around cones before completing a color-matching ball placement task.
- c) Tarkam Throw: Students threw balls at target plastic bottles, aiming to knock them down.

All activities were well-received by students, who showed increased motivation and excitement. Teachers also reported improved student engagement and coordination during the games.

Evaluation Stage.

Feedback from validators guided minor product revisions:

- a) The adaptive PE expert emphasized aligning game complexity with student characteristics.
- b) The school PE teacher recommended supplementing the product with video tutorials to enhance teacher understanding.
- c) The media expert advised improving visual design with engaging images and color schemes to increase appeal.

Table 1. Validation by Adaptive Physical Education Expert

| No | Indicator | Score (Max 5) |
|----------------------------|--|---------------------------------|
| 1 | The model suits the needs of students with intellectual disabilities | 5 |
| 2 | The model is easy to implement in daily teaching | 5 |
| 3 | The model increases student motivation | 5 |
| 4 | The model improves motor skills | 5 |
| 5 | The model is easy to understand | 5 |
| 6 | The model provides sufficient variation | 5 |
| 7 | The game model increases confidence | 5 |
| 8 | The model supports physical development | 5 |
| 9 | The activities are fun and engaging | 4 |
| 10 | The learning is enjoyable for students | 4 |
| 11 | The learning is varied | 5 |
| Total | | 53/55 |
| Percentage Validity | | 96.36% |
| Conclusion | | Very Valid – No revision needed |

Table 2. Validation by Inclusive PE Teacher

| No | Indicator | Score (Max 5) |
|----------------------------|---|---------------------------------|
| 1 | The model is easier to apply | 5 |
| 2 | The game supports student participation | 5 |
| 3 | Increases physical endurance | 4 |
| 4 | Helps understanding through physical activity | 5 |
| 5 | Improves social skills | 5 |
| 6 | Enhances gross motor skills | 4 |
| 7 | Stimulates student enthusiasm | 5 |
| 8 | Increases interest in PE lessons | 5 |
| 9 | Creates interactive learning environment | 5 |
| 10 | Builds student self-confidence | 5 |
| 11 | Activities suit student abilities | 5 |
| 12 | The game concept is clearly integrated | 5 |
| Total | | 54/60 |
| Percentage Validity | | 90.00% |
| Conclusion | | Very Valid – No revision needed |

Table 3. Validation by Media Design Expert

| No | Indicator | Score (Max 5) |
|----------------------------|---|------------------------------------|
| 1 | Attractive design and layout | 5 |
| 2 | Proper layout proportion | 5 |
| 3 | Legible and appropriate font | 5 |
| 4 | Visually engaging text layout | 5 |
| 5 | High-quality images | 5 |
| 6 | Standard module/book size | 4 |
| 7 | Language is easy to understand | 5 |
| 8 | No misleading expressions | 4 |
| 9 | Language follows correct grammar | 5 |
| 10 | Consistent typography | 5 |
| 11 | Text design attracts readers | 5 |
| 12 | Proper spacing between lines and characters | 5 |
| Total | | 53/60 |
| Percentage Validity | | 88.33% |
| Conclusion | | Valid – Minor revision recommended |

Table 4. Summary of Validation Results

| No | Validator | Validity Score (%) | Name | Conclusion |
|------------------------|----------------------------|--------------------|-----------------------------|--------------------------|
| 1 | Adaptive PE Expert | 96.36% | Perabu Nita, M.Pd. | Very Valid – No revision |
| 2 | Inclusive PE Teacher (ABK) | 90.00% | Pandewi | Very Valid – No revision |
| 3 | Media Design Expert | 88.33% | Dr. Jujur Gunawan Manullang | Valid – Minor revision |
| Average Validity Score | | 91.56% | | Very Valid |

Discussion

This study aimed to develop a game-based physical activity learning model for children with intellectual disabilities (Tunagrahita) at SD Negeri 30 Palembang. The research followed the ADDIE model—Analyze, Design, Develop, Implement, and Evaluate—to create and validate a practical learning product adapted to the unique needs of these learners. The results highlight several key findings related to the practicality, engagement, and validity of the proposed instructional model.

The analysis phase revealed a significant gap between the instructional methods traditionally used and the specific needs and interests of students with intellectual disabilities. Observations and teacher interviews indicated low student motivation, minimal participation, and a lack of variation in PE activities, which led to disengagement during lessons. This supports previous literature suggesting that learners with intellectual disabilities require adapted and stimulating physical activities to foster participation and motor development (Brink, 2025; Civelek & Uyanık, 2023).

During the design and development phases, a series of ball-based games—Zig-zag Ball, Bola Kelok 8, and Lempar Tarkam—were structured to promote motor coordination, spatial awareness, and enjoyment. These activities were designed to be visually stimulating, simple to understand, and achievable for students with varying abilities. Validation by experts in adaptive physical education, inclusive PE teaching, and educational media confirmed the model’s relevance and alignment with student characteristics. The average validation score was 91.56%, categorizing the product as "very valid" and requiring no major revisions.

The implementation phase confirmed the effectiveness of the model in increasing student enthusiasm, participation, and physical engagement. Students demonstrated higher levels of confidence, motivation, and attention during game-based activities compared to prior PE lessons. The structured sequence of warm-up, core activities, and cool-down sessions provided consistency, while the varied games kept students actively involved. These

findings are consistent with (Plass et al., 2020) that game-based learning enhances cognitive, emotional, and physical outcomes in children through dynamic and exploratory experiences.

Furthermore, expert evaluations during the final phase recommended minor refinements, such as enhancing the visual appeal of the printed materials and supplementing the instructional guide with video content. These enhancements were incorporated, ensuring broader accessibility and usability for both teachers and students.

Overall, the model demonstrated practical and pedagogical strength in promoting inclusive physical education. The results underscore the importance of designing learning models that are not only physically adaptive but also cognitively and socially engaging for children with special needs. Implementing such models in inclusive classrooms could help address common challenges in PE for students with disabilities, including motivation, participation, and motor skill development. The success of this project suggests that game-based physical learning models can serve as a powerful tool to transform the learning experiences of students with intellectual disabilities, providing them with equitable opportunities to grow, learn, and thrive.

Conclusions

This study successfully developed a game-based physical activity learning model tailored for students with intellectual disabilities (Tunagrahita) at SD Negeri 30 Palembang. Utilizing the ADDIE model (Analyze, Design, Develop, Implement, Evaluate), the research addressed the lack of engaging and inclusive physical education approaches for children with special needs.

The development process resulted in a product comprising structured physical games—Zig-zag Ball, Bola Kelok 8, and Lempar Tarkam—designed to enhance motor skills, social interaction, and student motivation through enjoyable and adaptive activities. Validation from three experts, namely an adaptive physical education specialist (96.36%), a special education PE teacher (90%), and an educational media expert (88.33%), yielded an average validity score of 91.56%, categorizing the model as very valid.

Implementation of the model demonstrated increased student participation, enthusiasm, and physical involvement, indicating the practicality and effectiveness of the designed activities. The model also contributed to building students' self-confidence and social engagement during physical education sessions. Feedback from expert evaluations confirmed that the model was both pedagogically sound and contextually relevant, with minor suggestions related to design enhancements.

In conclusion, the game-based physical activity learning model is a highly valid, practical, and beneficial instructional tool that addresses the unique needs of students with intellectual disabilities. It provides an inclusive, engaging, and developmentally appropriate framework for physical education in special needs contexts. Future research is recommended to assess the long-term impact and scalability of the model in broader educational settings.

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