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# Motion and sound games model for improving cognition of early childhood

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**ABSTRACT**

The early childhood stage is a phase that holds important basic development holistically, covering affective, psychomotor, and especially cognitive domains. This development will be able to be effectively reached with an appropriate learning process in kindergartens. This study aims to reveal a relevant approach to learning using motion and sound games in improving early childhood cognitive development. The method used in this study is Research and Development (R&D) from Borg and Gall, involving 124 early childhoods and kindergarten teachers in the city of Cimahi, Indonesia, selected through convenience sampling. The instruments employed are questionnaires, observation notes, interviews, and desk evaluations (expert and practitioner judgment). The data are descriptively calculated through a t-test with $p<0.000$ in order to reveal the learning model for improving children's cognition through motion and sound. The results of this study show that the motion and sound–based models consist of design planning, learning process, and evaluation that are able to be implemented well and can be categorized as a model that is able to develop early childhood cognition, but it still needs to be innovated and continue to be creative again in more affordable learning steps for children. Studies with the related topics are expected to relate basic potentials and social skill optimization. It is also recommended that this study contributes to the development of learning in Indonesia.

**Keywords:** motion and sound game model, early children cognition, motor learning

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## INTRODUCTION

Within the early childhood stage, all important components supporting the learning process to the next level, as such cognitive development, are also important for their development through the learning process taught through games (Kesäläinen et al., 2022). At that stage, they can improve their academic ability which could possibly be their success prediction at school (Silverman & Mercier, 2015). Development and learning are complex and holistic, but skills across all developmental domains can be encouraged through play, including motor, cognitive, social, and emotional skills (Perkins & Taylor, 2009). Education and learning at the pre-school level play an important role in the process of child development. This means that preschool education is seen as a level of education needed in developing various domains, such as the social realm of communication, the formation of gross and fine motor skills, adaptive abilities, and social skills (Battaglia et al., 2019).

Through play, children can channel all their desires, their satisfaction, their creativity, their social spirit, their physical motor skills, their communication skills, and their imagination (Monti et al., 2019). Additionally, they can carry out various activities through play as well. Children learn, socialize, and interact with their peers to foster positive life attitudes. They develop their roles, increase their vocabulary, channel their depressed feelings, and express their feelings freely through play (Cheraghi et al., 2022).

Games as fun activities for children can be used as an educational method or tool that is useful to improve language skills, think and get along with the environment, or to strengthen and skill the child's limbs, develop personality, bring closer the relationship between educators and students, then channel the activities of students and so on (Majumdar, 2020). It is through interaction with the environment that children organize their sensations and experiences in developing their brain abilities through the achievement of cognition and intelligence abilities (Kesäläinen et al., 2022). The games carried out in the children's learning process have an emphasis on the process of developing children's cognition using a thematic approach. Therefore, games in the process of developing the cognitive potential of early childhood are a learning model that is very suitable from all points of view (Bedard et al., 2018). Games are an essential component of any approach, strategy, or method (Dapp et al., 2021).

When early childhood plays using music paired with movement, children are engaged and focused on the content (Williams, 2018). In the learning process, teachers use music starting from the early years of early childhood. They use music to start the day and greet each other, and learn names, letters and numbers. In early childhood classrooms, individuals will often walk into the room to hear songs to transition from one activity to another or to attract students' attention. When children engage and participate, they are more likely to retain the information presented (Temple et al., 2016). As researchers looked more into this area, they found a lack of research focusing on the specific use of physical activitiesthrough motion and sound (Dewi et al., 2015; Sultan et al., 2020). Many articles refer to the fun factor of using music with children and do not see the potential for using it as a tool to teach key skills and movement concepts in early childhood (Faber, 2017; Pogue, 2018; Sultan et al., 2020; Williams, 2018).

Active involvement in music activities for movement and sound in early childhood is developmentally appropriate, and these activities are easy to implement in the preschool classroom. Many teachers are already using music activities as a regular part of their early education program (Sultan et al., 2020). The evidence discussed in this paper suggests that musical activities can be designed more specifically to stimulate children's skills in beat synchronization and motor coordination, thereby establishing self-regulation through the early years of childhood capable of stimulating early childhood cognitive development (Williams, 2018).

In addition, several studies have shown that physical exercise induces beneficial effects on cognitive function (McLoughlin & Oliver, 1998; Rodríguez-Negro et al., 2020). Playing in an open field accompanied by music as a medium for early childhood is the right context to positively influence students' creativity, attention capacity, and control impulses (Monti et al., 2019). However, the effect of physical exercise on cognitive function depends on environmental influences and on the type, duration, and intensity of the physical exercise performed (Ruiz & Linaza, 2015). It is known that different types of physical exercise interventions have different effects on cognition (Kesäläinen et al., 2022).

However, little is known about what types of intervention models are most effective in improving attention, creativity, and impulse control in children (Draper et al., 2012; Rojas et al., 2020). This information is needed to plan cognitive enhancement content for motion lessons in kindergarten because preoperational reasoning appears in young children from about ages 2 to 6 in kindergarten and is characterized by a dramatic leap in the use of symbolic thinking that permits young children to use play using their own thoughts and imaginations to guide their behavior, including cognitive development (Rodríguez-Negro et al., 2020). Therefore, as an effort to develop early childhood cognition, various efforts are needed in the process of developing an effective learning model to be able to achieve it. In an effort to achieve this, it is necessary to conduct research that can lead to these problems. Therefore, this research is focused on developing a learning model based on motion and sound games (Gesuk) as a model to facilitate cognitive development in early childhood as needed for teachers.

# METHOD

## Procedure

This study aims to develop and validate a learning model through motion and sound games to improve early childhood cognition (knowledge, understanding, application, evaluation, analysis, and creativity). This research method uses Research and Development (R&D). According to Borg and Gall (2003), the R&D method is useful for developing, perfecting, and validating certain products in various fields, such as education and teaching. It is appropriate for this research to look at how the Gesuk Model develops to improve cognition skills in early childhood, which are required for teachers to design instructional materials. Figure 1 describes how the steps in the R&D cycle.

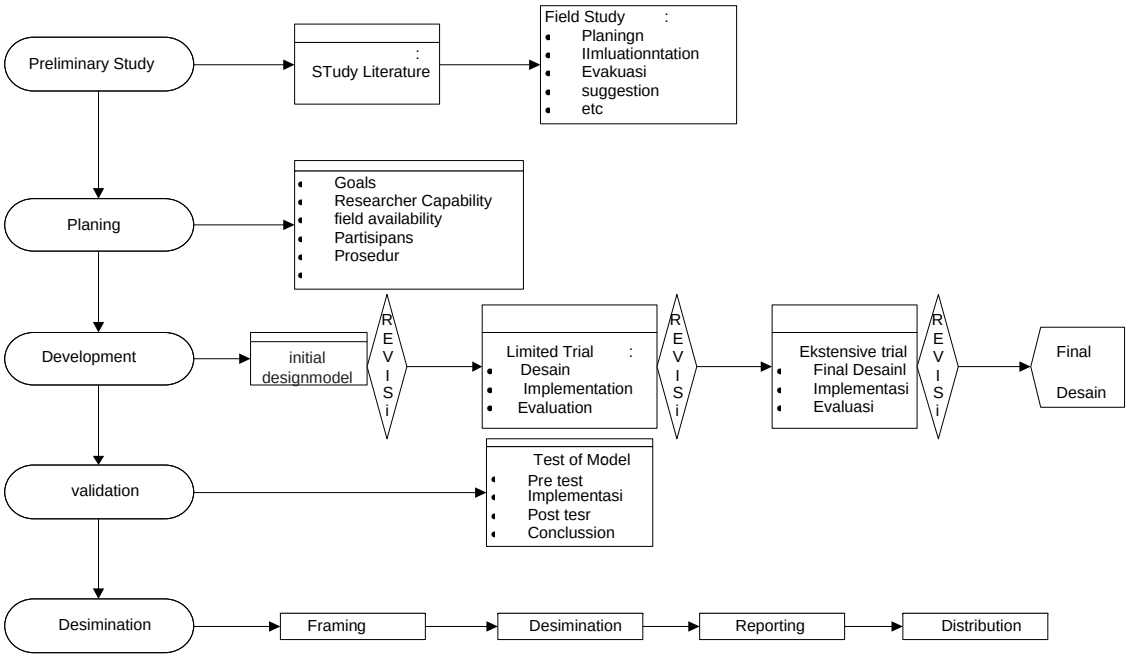


**Figure 1. The Major Steps in R&D Cycle**

Researchers in the study tried to divide it into five stages, namely the development stage and the testing stage. Here are the steps.

### *Preliminary study*

The preliminary study is a series of activities derived from literature studies, technical planning, and administrative processes as well as preliminary studies. A literature study is an activity that aims to comprehend various sources and policies pertaining to the early childhood education implementation process, such as theories that support the model development process, laws and regulations, curriculum documents and early childhood education in learning process guidelines, standards pertaining to the early childhood education implementation process, and the results. The results of previous research are relevant to the learning model developed.

### *Planning*

The process of planning and preparing administrative technical research by creating designs, grids, instruments, and research sites. Administrative techniques are carried out, such as participing with relevant agencies such as kindergartens that have been recommended by the Education Office. research planning steps with procedures that refer to what has been formulated in the research objectives. This procedure can be used as a guide for researchers in taking the steps in this research.

***Development stage***

The development stage of the learning design model consists of the steps described above. The stages include preliminary studies, planning in the context of developing learning design models, and developing learning design models. The development of the model is done by using motion and sound games to improve early childhood cognition.

***Validation***

The validation test phase was carried out to determine the effectiveness of the developed model. Meanwhile, to see the effectiveness of the developed Daily Activity Plan (RKH) with observational note used in this test, this study used two research methods. The methods are (1) a descriptive method with a qualitative approach and (2) a quasi-experimental method with a *pretest-posttest control group research design* with a quantitative approach. A descriptive method is used in collecting and presenting data regarding the preparation of the RKH. The RKH describes the description of basic competencies, learning objectives, learning materials, indicators, scenarios, and learning evaluation tools.

***Dissemination***

Research activities include wider trial activities involving kindergarten's teachers. Through the responses (responses) and the results of observations made when the trial was carried out, the final model of this research was compiled, namely: Motion and sound games (Gesuk)'s model for cognitive development in early childhood.

***Participants***

This research was conducted in a number of kindergartens in the Cimahi city area, Indonesia. According to the data that has been collected, the total number of kindergartens in Cimahi City is 109. The number is spread over 3, districts with a distribution of 31 in North Cimahi, 38 in Central Cimahi, and 32 South Cimahi. There are as many as 8 that do not have NPSN. The total number of students is 11,575 people spread across public, private, Kober, TPA, and SPS PAUD. The number of teachers or educators in all of the Cimahi City neighborhoods are 1.411 people. The participants involved in this study consisted of teacher and student participants who were taken with convenience sampling which can be seen in the following Table 1.

**Table 1. Data on student institutions and kindergarten teachers involved in research**

| No | Name of Kindergarten | Region | Cluster | The Number of Students | Total Number of Teachers |
|---|---|---|---|---|---|
| 1. | Kindergarten State builder | South Cimahi | Core | 22 | 3 |
| 2. | Nusa Indah Kindergarten | South Cimahi | Impact | 22 | 2 |
| 3. | Kindergarten Audita | South Cimahi | Impact | 20 | 2 |
| 4. | Pandiga Kindergarten | Central Cimahi | Core | 19 | 3 |
| 5. | Lotus Kindergarten | Central Cimahi | Impact | 20 | 2 |
| 6. | Kindergarten Tunas Bhakti Pertiwi | Central Cimahi | Impact | 22 | 2 |
| 7. | Dayang Sumbi Kindergarten | North Cimahi | Core | 20 | 2 |
| 8. | Teak Mekar Kindergarten | North Cimahi | Impact | 20 | 2 |
| 9. | Nurul Ar-Rahman Kindergarten | North Cimahi | Impact | 19 | 2 |
| | TOTAL | | | 184 | 20 |

The participants who were directly involved in this study were students and teachers of class B. The reason for the specific selection of participants who only involved class B was that the game was a learning activity carried out by students. There are simple rules that must be understood by children. Class A children have not been able to understand and understand the rules of a game, plus class The children are students who are just learning to interact with friends and the surrounding environment, while class B is almost entirely made up of children who repeat

in each of these schools. Every participant in this study is listed in Table 2.

**Table 2. Participants in every step**

| Step in Research | Name of Kindergarten | Total Class |
|---|---|---|
| Modeling | Pandiga Mutiara | 1 |
| Limited Trial | Dayang Sumbi, TK Pembina, | 2 |
| Extensive Trial | Teratai, Audita, Nusa Indah dan Jati Mekar | 2 |
| Eksperimen Group | Pandiga Mutiara | 1 |
| Control Group | Nurul Ar-Rahman | 1 |

***Instruments***

This section describes in detail the instruments or data collection tools used in the research. The research instruments used were questionnaires, observation notes, interviews, and desk evaluations (assessment of experts and practitioners).

*Questionnaires*

There are three sets of instruments in this study, including 1) a questionnaire on the learning process in the development of cognition in the field; 2) a questionnaire to determine the development of cognition in; and 3) an evaluation model for the process of developing cognition. Those questionnaires have reliability with all $r > 0.05$ (0.914; 0.800; 0.899).

*Observation Notes*

Class observations were carried out to observe and measure the behavior of teachers and students in real situations in the learning process. The behavior in question is what has been designed based on the learning design model developed. Observations during the trial were carried out to collect teacher information about using the learning process. In addition, look at the consistency of the pattern of learning interactions between teacher and students that have been scripted in the RKH. Likewise, with the implementation of the evaluation, which aims to assess the competence of students according to the level of basic competence. Data collection through observation was compiled in the form of observation guidelines in the form of a checklist, both for documents.

*Interviews and desk evaluations*

The interview guide was used to obtain data, information, and inputs for improving the model construct from the expert team's point of view. The interview process was used in the pre-survey stage, development stage, and trial stage. This was done to obtain information in order to improve the model at the development and trial stages. The type of interview used is an unstructured interview, namely an interview that requires an open answer. The process is to facilitate the implementation of interview activities. Interview guidelines are made by determining questions that are appropriate to the topic of the problem being researched. In desk evaluation, the results of the assessment as well as input from experts and practitioners are used as material for consideration in improving and perfecting the design model that is being developed by researchers with the evaluation of experts and practitioners.

## FINDING AND DISCUSSION

### Finding

***Preliminary result***

The results of observations and interviews in the preliminary study found that almost 85% of the cognitive development process was still focused on the process of developing the ability to read, write, count in mathematical concepts, and do simple science. The development process is still focused on activities that have a complete learning process, such as processes at higher education levels than early childhood education.

The types of methods that exist by almost 35% are often less consistent and less relevant. Many reasons from teachers, such as students not being conducive, adjusting to children, or because of incidents, and many other reasons that are considered inappropriate. This, of course has an unfavorable effect on the implementation process. The implementation process is often less than optimal. From the observations, almost 30% of the implementation process is not in accordance with the previous plan. The level of suitability of the method is almost 35%. Teachers still use methods that are less relevant to an early age, so that the level of learning achievement is very minimal as well as the level of effectiveness. Barriers that often arise in the use of appropriate methods are the level of teacher knowledge and understanding of the appropriate method within the material and the age level and characteristics of childhood.

***Planning results***

The learning process to improve early childhood cognition was developed using motion and sound games as a psychomotor and language development process. The two potentials that were developed simultaneously were carried out to improve early childhood cognition where the design was adjusted to the principles of the early childhood learning model. The most suitable learning model for early childhood is learning through games. The initial design of this model started from the initial design of the game model, which is usually implemented in an early childhood learning process. The development of all program components in the initial design of the program refers to a pattern that has been developed in the field but is adapted to the form of a motion and sound game-based learning model to improve early childhood cognition with the Gesuk Learning Model.There are: environmental exploration, exploration direction, and guided exploration (teacher activities & student activities).

***Development results***

At this stage, learning steps have been formed in accordance with the planning stage before.

**Table 3. Teachers and students' activities in Gesuk learning model**

| Desain Implementation of Model | Teacher Activities | Student Activities |
|---|---|---|
| Environmental Exploration | 1. Student pick-up | 1. Students may play with media that have been prepared as props that will be used in the process |
| | 2. Prepare media for children's exploration, so that children are interested | 2. Children perform marching activities with music or, singing that makes children happy and excited. |
| | 3. Preparation for marching activities, ceremonies or sports | |
| Exploration Directions | 1. Guiding religious activities specifically for the formation of children's basic behavior | 1. Carry out religious activities that are directly directed by the teacher. |
| | 2. Preparing for morning discussion and storytelling | 2. Conduct discussions and tell stories in the morning about the media the children have seen. |
| | 3. Provide information about the objectives and topics to be discussed | 3. Students listen to information or study/play rules that day. |
| | 4. Delivering learning content according to the planned topic | 4. Students provide input and may choose the activity they will do first. |
| Guided Exploration | 1. Provide guidance for student activities in learning; | 1. Students carry out and follow the entire learning/game process according to the existing theme |
| | 2. Providing reinforcement for learning behavior | 2. Students always follow the rules of the game. |

Table 3 describe the implementation stages of developing a scrolling learning model that has been validated as a development model from a model that has been tested.

***Validation results***

The validation test was carried out in one of the early childhood education classes, which was considered adequate from various aspects as a class for experimentation. The early childhood education appointed is Pandiga. Pandiga is considered well qualified by all circles, including referrals from the Cimahi City Education office because of the availability of the required facilities and infrastructure, such as classroom conditions, completeness of facilities and facilities, media and other supporting books. In this case, the teachers have integrity and good performance in the Cimahi City environment. The model design to be validated is a model that has been developed in trials which is continuously revised to obtain the most effective model to be validated as the final model of the learning model through motion and sound games to improve early childhood cognition. Here's an overview of the model.

Based on the evaluation results from the extensive trials that have been carried out, all the steps and stages of the model that were developed were acceptable and well implemented in the field. Increasing teacher understanding must always be maintained in the process of understanding the model because teachers are still often hesitant in the process of implementing the stages of this model. This is a natural thing because teachers still need in-depth adjustments to the model. The revision process was carried out to further optimize the model development for further trials. Table 4 is the description of the development process for the implementation of existing models tested try.

Learning outcomes for improving cognition that has existed based on interview and observational data are still highly dependent on the process of developing mathematical, scientific, and scientific abilities. Meanwhile, from the results of the questionnaire data, it is shown that the types of evaluations that exist, almost 55 % of respondents stated that they are still very diverse. Evaluation of learning outcomes is only 25%. Meanwhile, the evaluation of the process has only reached 20%.

The form of evaluation that has been developed so far is a form of evaluation of children's work. Almost 90% of respondents agree. The achievement of the evaluation results of 100% is optimal in accordance with expectations. Existing evaluation results are typically used as a reference in future development, and 100% of respondents agree with this. Meanwhile, in terms of the impact of the 100% evaluation, it certainly has a very positive impact on children's development. Table 5 is a description of the learning outcomes carried out through the evaluation process so far.

The conclusion of the learning outcomes data in the field stated that the evaluation process had been carried out well, but there were several obstacles encountered by the teacher, such as characteristics, physical conditions, and child psychology, which were the main inhibiting factors.

Assessment techniques are carried out through observations, assignments, performance, portfolios, parent reports, and descriptions of children's profiles. The assessment has always focused on the process rather than the results. The form of assessment that is usually carried out by teachers is in the form of oral and written evaluations that are periodically given to parents. Oral assessment is carried out by the teacher in coordinating the achievement of children's developmental levels related to the formation of attitudes and motivation of children in learning, while the written assessment is an assessment of the results of the achievement of children's learning processes in schools that have been running so far. Assessment can be in the form of weekly reports, monthly reports, or semi-annual reports. The format of the assessment indicator is usually applied. The formats are undeveloped (BB), starting to develop (MB), developing as expected (BSH), and very well developed (BSB).

The draft model that was tested in a broad trial is basically able to improve children's cognition well because children develop all cognitive stages from knowledge, understanding, application, evaluation, analysis and creativity. The following are the results of the *pretest-posttest analysis* of children's cognitive development in the broad test in four kindergartens

through the SPSS 20 statistical test. The calculation results are shown in the Table 6. Broad trials are basically able to improve children's cognition.

**Table 4. Learning steps of the Gesuk model for early childhood cognitive development**

| Learning Steps | Description |
|---|---|
| Design | 1. Determine learning objectives |
| | The objectives are developed through reviewing curriculum documents by reviewing competency standards and basic competencies. |
| | 2. Learning program development |
| | The development of learning programs is carried out through the processes of determining themes, making a matrix of the relationship between competencies and themes in the form of a theme network, and determining the allocation of learning time. Then it is poured into the Weekly Activity Plan (RKM) and finally poured into the Daily Activity Plan (RKH). |
| | 3. Determining the material |
| | Determination of material is always associated with materials that are able to help develop cognition in early childhood. |
| | 4. Determining learning methods and strategies |
| | The methods and strategies to be used must always be in accordance with the existing material and the level of early childhood development. |
| | 5. Determining learning resources, tools and media |
| | Sources, tools, and media must always be able to assist the learning process and children's exploration in developing early childhood cognition. |
| | 6. Evaluation tool development |
| | An evaluation tool in the learning process is a tool that is used as a means for the assessment process in achieving the overall learning process including planning. The process and outcome assessment process is always adjusted to the child's cognitive development process. |
| Implementation | 1. Environmental exploration |
| | Children's explorationof the the environment, media and learning resources. Children play and play all the media that are ready to support the process. |
| | Line up using music and songs that can motivate children or games that are created according to a predetermined theme. |
| | 2. Direction exploration |
| | Morning discussion or story, as an activity to explore the information that the children have obtained during their environmental exploration this morning. |
| | Religious activities for the formation of children's basic behavior through habituation activities such as reading prayers, short letters, or reading prayers, etc. |
| | Students listen to information or study/play rules that day. |
| | 3. Guided exploration |
| | Student activities in learning with varied methods. |
| | Children are always in an active learning framework through motion and sound games. |
| | 4. Feedback exploration |
| | Provide *feedback* on the behavior shown by students; |
| | Carry out process and outcome assessments; as well as Provide opportunities for students to ask questions and answer based on their experiences. |
| Evaluation | Evaluation in this process is divided into 2 parts |
| | 1. Evaluation of the learning process |
| | 2. Evaluation of learning outcomes. |

Table 6 shows that in a broad trial in the two groups, there were differences in cognitive abilities before and after the treatment. Based on the results of the extensive trial analysis, it appears that there is a significant difference between the pre- and post-test with Mark overall $p<0.005$ . That is, the design development of this model takes effect and significantly enhances early childhood cognition. The results of extensive trials carried out are constantly being improved to increase the effectiveness of the models being developed.

**Table 5. Learning evaluation results**

| No | Aspect | f | % |
|---|---|---|---|
| 1. | Types of evaluation that are usually carried out | 4 | 20 |
| | | 5 | 25 |
| | | 11 | 55 |
| 2. | Commonly used test forms | 20 | 100 |
| 3. | Optimization of evaluation results | 20 | 100 |
| 4. | Evaluation result | 20 | 100 |
| 5. | Impact evaluation | 20 | 100 |

**Table 6. The results of the trial calculation large swipe to enhancement early childhood cognition**

| No | Group name | The results of the analysis of the increase in cognition early childhood | | | |
|---|---|---|---|---|---|
| | | Mean Difference | Std Error Difference | t | Sig. (*2-tailed*) |
| 1. | Ex 2 area to 1 | 0.40476 | 0.18504 | 2.187 | 0.035 |
| 2. | Ex 2 area to 2 | 114.286 | 0.28621 | 3.993 | 0.000 |
| 3. | Ex 2 area to 3 | 180.952 | 0.30042 | 6.023 | 0.000 |

***Dissemination results***

The distribution and implementation of this model was carried out in four kindergartens, namely Dayang Sumbi, Audita, Tunas Bhakti Pertiwi, and Teak Bloom. The kindergarten chosen by the researcher is considered adequate in terms of various aspects. The four institutions are considered to be very representative, apart from being seen from the cluster as well as from the position in each kindergarten. Two kindergartens are categorized as Core Cluster Kindergartens, namely Dayang Sumbi Kindergarten and Tunas Bhakti Pertiwi Kindergarten, while the other two, namely Audita Kindergarten and Jati Mekar, are in the Impact Kindergarten category. All the steps and stages of the model that were developed were acceptable and well implemented in the field. Increasing teacher understanding must always be improved in the process of understanding the model because teachers are still often hesitant in the process of implementing the stages of this model. This is a natural thing because teachers still need in-depth adjustments to the model.

**Discussion**

Overall, From the results of a preliminary study in the field, it was found that almost 85% of the cognitive development process was still focused on the process of developing the ability to read, write, count in mathematical concepts, and simple science, or rather the development of general knowledge and science skills, concepts of shape, color, size, and patterns, concepts of numbers, symbols of numbers and letters (Permen No. 58 of 2009). This has indeed become one of the normative rules for all institutions as well as teachers to always follow what has been outlined by the supervisors and also elements related to the process of developing the early childhood education curriculum in the field. One of the policy aspects, is the lack of understanding of the Human Resources (HR) involved in early childhood education regarding the process of developing cognition.

According to Piaget, cognitive development is a development that occurs and is not only the result of the maturity of the organism, not only environmental influences, but the interaction between the two. In this view, the organism is actively in contact with the environment. Actions or, more specifically, adjustments to objects in their environment are a dynamic process of interaction (Beers, 2019). So, when the cognitive development process only focuses on the ability to read, write, count in mathematical concepts, and do simple science, then some of children's cognition has not developed optimally. To be able to maximize the development of early childhood cognition, the learning process and all learning components must be maximally supported.

Development of learning programs through game motion and sound is done through the processes of determining themes, making a matrix of the relationship between competencies and themes in the form of a theme network, and determining the allocation of learning time. Then it is poured into the Weekly Activity Plan (RKM) and finally poured into the Daily Activity Plan (RKH). Learning through theme compatibility will make it easier for early childhood to learn motor skills well and achieve the desired outcome (Jones et al., 2020; D. B. Robinson et al., 2018; L. E. Robinson, 2013). The methods and strategies that will be used must always be in accordance with the existing materials and the level of development of early childhood. Sources, tools, and media must always be able to assist the learning process and children's exploration in developing early childhood cognition.

The content or curriculum outlined through the learning model may have changed in each ongoing learning process, but the concepts and ideas of teaching early childhood seem to be the same in order to adapt with Step its development. From an early age, early childhood has characters that do not compartmentalize their thinking or work, but rather they learn through interconnected experiences (Pogue, 2018). The focus is on the relationship between the integration of music and motion into the classroom or scene learning for the development early childhood cognitive skills through play (Rudd et al., 2020). Playing should be considered educational because it must teach something new to children. Representation This article summarizes the tensions associated with contemporary perspectives on pedagogical play in early childhood education and illustrates the need for principles of play-based learning through motion and sound to inform early childhood (Pramling et al., 2019).

Cognitive development is a development that occurs and is not only the result of the maturity of the organism and environmental influences, but also the interaction between both (Faber, 2017; Ren et al., 2018; Sabri et al., 2022). In this view, organisms are actively in contact with the environment. Actions or adjustments to objects in their environment is a dynamic interaction process (Rojas et al., 2020). Therefore, when the cognitive development process only focuses on the ability to read, write, count in mathematical concepts, and do simple science, then some of the children’s cognition has not developed optimally (Osorio-Valencia et al., 2018). To be able to maximize the development of early childhood cognition, the learning process and all learning components must be maximally supported. including through game motion that includes psychomotor aspects (Bhatia et al., 2015).

Psychomotor aspects can be divided into the gross motor and prime motor aspects. Gross motor movements involve large muscles, whereas fine motor movements involve smaller muscles. Significant muscle activity in gross motor function includes the trunk muscles used for sitting and the leg muscles for walking. Fine motor skills are the small muscles used by the fingers and tongue to write and speak. In various studies, the cognitive and psychomotor domains are included in many aspects that accelerate its development. Thus, teachers can prevent the negative consequences of slowing down through classroom learning methods through the existing curriculum provided (Cueto et al., 2017).

The learning process in the field is still focused on completing learning activities such as processes at higher education levels than those in early childhood education. The learning process for early childhood should be a fun process. Nothing is more fun for early childhood than playing (Cheraghi et al., 2022). Play for children is natural and spontaneous without manipulation. Children in various parts of the world have not been taught to play. Children need play as a means to develop their potential (Barnett et al., 2022; Majumdar, 2020). Play is an important vehicle to

improve children's development, both social and emotional development, cognition, and reflection of all their potential. Playing for children has a very important meaning. Through play, children can channel all their desires, their satisfaction, their creativity, their social spirit, their physical motor skills, their communication skills, and their imagination. Through play, children can carry out various activities and activities of life. Children learn, socialize, and interact with their peers to foster positive life attitudes. Children express themselves freely as they develop their roles, expand their vocabulary, and channel their depressed feelings through play (Perkins & Taylor, 2009). Games provide opportunities for practice and thinking so that children can experience and learn through all kinds of materials, media, equipment, and facilities and infrastructure in the children's learning environment. Game activities are able to naturally encourage children's physical and language abilities through touching, exploring, feeling, testing, experimenting, thinking, telling stories, or even lightly discussing with children's language styles (Zhang et al., 2018). Through the process of playing, children will gain an understanding of their world, and as a result, they are able to learn with fun in understanding the world. Through interaction with the environment, children organize their sensations and experiences in developing their brain abilities through the achievement of cognitive abilities and intelligence (Ren et al., 2018).

Piaget developed his theory of cognitive development after making extensive observations of his own children, including their play with observed knowledge, understanding, application, evaluation, analysis, and creativity (Kesäläinen et al., 2022; van der Fels et al., 2020). He argues that children actively acquire knowledge through interaction with the environment through physical activity. In particular, cognitive development occurs through complementary processes of assimilation and accommodation. In assimilation, the child interprets the environment in terms of his current way of thinking. Previous research has also observed an increase in children's cognitive function after a physical activity program, which showed that for improving cognitive function (knowledge, understanding, application, evaluation, analysis, and creativity), it is suggested using balance movement activities, dancing to music, throwing and catching (Osorio-Valencia et al., 2018; Ren et al., 2018; Rodríguez-Negro et al., 2020).

For example, a child who uses a box as if it were a car assimilates the box with his or her mental concept of a car. Accommodation, on the other hand, consists of the child changing and extending what he already knows. When the child encounters something in the environment that he does not understand, the child must expand, through accommodation, his view of the world and thereby restore balance. Play, according to Piaget, gives children many opportunities to interact with materials in the environment and build their own knowledge of the world. Thus, play is one of the main contexts in which cognitive development occurs throug physical activity (Singer et al., 2006).

Motor learning experiences designed through appropriate learning models for early childhood can affect brain plasticity and cognitive development in children (McLoughlin & Oliver, 1998; Osorio-Valencia et al., 2018). For this purpose, novelty, diversity, effort, and success appear to be essential ingredients for making learning experiences meaningful for this purpose in the learning process organized learning for early childhood. All of these characteristics are included in the construct of variability as understood in informational and ecological approaches to motor skill learning in general. To transition theory into practice, practice variability can influence the development of cognitive and particularly executive functions (Martzog et al., 2019; Ruiz & Linaza, 2015). In this context, research uncovers the role of learning models to support key transitions in the development of cognitive control, looking at the relationship between repetition and changes in physical activity in terms of the exchange of benefits of stability and flexibility (Monier & Droit-Volet, 2019).

## CONCLUSION

The learning model based on motion and sound games is a model that is able to develop early childhood cognition. The model framework consists of planning design, implementation of the learning process, and evaluation of results. Learning program design is a series of activities

consisting of determining learning objectives, developing learning programs, determining materials, determining learning methods and strategies, determining sources, tools, and media, and developing evaluation tools. The learning implementation process consists of four main steps, namely environmental exploration, guided exploration, independent exploration, and feedback exploration. The model has been proven to be significantly effective for developing early childhood cognition. This model is not the most perfect model for developing early childhood cognition, so it is expected that every teacher and other related parties always conduct various kinds of in-depth studies of other models that are considered the most appropriate and relevant to the world of early childhood. Through research related to similarly relevant learning models, we hope to be able to continue to explore various theories that are more relevant and broader so that we will be able to produce further research that can develop this study by connecting basic potential and the achievement of social skills. Some of these recommendations are the expectations of researchers, so that the results of this study gave significant contributions, especially for the parties involved in improving early children's cognition in Indonesia.

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