Educational Administration: Theory and Practice
2024,30(4), 2211-2220
ISSN:2148-2403
https://kuey.net/

Research Article

Effectiveness of Seven Steps of Project based Learning (PJBL) in Kndergarten

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Citation: Ayu Mustika Sari, Effectiveness of Seven Steps of Project based Learning (PJBL) in Kndergarten. *Educational Administration: Theory and Practice*, *30*(4), 2211-2220, Doi: 10.53555/kuey.v30i4.1835

ARTICLE INFO

ABSTRACT

This study reveals the effectiveness of the project-based learning (PjBL) model through seven steps of application. The application of the PjBL model in this study was carried out at the Yadiaksa Integrated Islamic Kindergarten. Before applying the seven steps of the PjBL model in kindergartens, this model has been validated by validators and declared valid for use in kindergartens. The seven steps of PjBL can be used in the learning process in kindergarten. The seven steps consist of: (1) essential questions, (2) Ignite project ideas through technology or educational games, (3) Drawing up a plans project on propose, (4) create project schedules, (5) guiding children when implementing projects, (6) assessing project results through percentages, and (7) evaluating children's experience and development. It found one steps which modify from six steps based on expert perspective. The application of the seven-step PjBL model shows that the model is effective and practical for improving child development in kindergarten.

Keywords: *Learning model, Project-based Learning (PjBL), Child development, Kindergarten*

INTRODUCTION

The development of the Project Based Learning (PjBL) model is something important to do . In the change, the independent curriculum in kindergarten emphasizes direct experience-based learning such as projects (Wulansari et al., 2019). The independent curriculum has also determined four project themes that can be chosen by the education unit in kindergarten (Sulistyati. Dyah M et al., 2021). Project-based learning model proven to improve child development (Intasena & Poonputta, 2022) and stimulate problem-solving skills in children (Putri et al., 2019a). The project-based learning model (PjBL) is proven to shape children's creativity and activeness in the learning process (Putri et al., 2019a).Therefore, the process of implementing learning using PjBL can increase the development of children in kindergarten optimally(Mahasneh & Alwan, 2018). Improving thinking and problem solving can be developed through project-based learning (Putri Junita et al., 2021).

Based on observations made at Yadiaksa Islamic Kindergarten, it was found that the unit had carried out the project, but did not understand the syntax in the project, there were no sources used as references for project implementation, and teachers were still limited in developing project themes set by the government and in implementing the project teachers had not used clear and complete stages. Addressing the challenges faced by educators for the implementation of project-based learning to stimulate children's cognitive development, it is necessary to develop one model that is considered capable of increasing and stimulating children's cognitive development. Seven steps of the project-based learning model need to be done to help educators in kindergarten, in order to get a clear picture of the stages of implementing project-based learning in kindergarten. In the learning process will help children be active so that children's abilities can be stimulated to the maximum.

The independent curriculum project theme has been determined, namely there are four major themes and each theme is handed over to the unit to develop according to the needs of each educational unit (Suryana et al., 2023). The four themes provided by the Ministry of Education and Culture are: (1) I love the earth, (2) I love Indonesia, (3) Play and cooperate, and (4) My imagination. The four themes can be seen in figure 1.

Figure 1. Theme of Independent Curriculum

From the four themes above, developed based on their respective school curricula, on this occasion researchers and schools chose the theme "I love the earth", with the sub-theme of cleaning the environment and caring for the environment through planting activities. Theme development can be seen in figure 2 below.

LITERATURE REVIEW

Project based Learning Model (PjBL)

Project-based learning models can improve students' cognitive development. (Sucipto, 2017) (Intasena & Poonputta, 2022) and can improve problem-solving learning (Ayuningsih et al., 2022). The project-based learning model has been proven to make students actively creative in learning (Nurhadiyati et al., 2020); (Ergül & Kargın, 2014), Research done by (Habibi et al., 2020b). The theories underlying researchers in designing the models of Projek Pelajar Pancasila are constructivist learning theory and collaborative theory. Constructivism theory plays an active role in building and constructing knowledge by looking for various ideas to produce a product (Muzana et al., 2021) (Dewey, 1938). Social constructivism argues that social groups help students build meaning for each other, thereby collectively and collaboratively creating various meanings and knowledge (Arda Tuncdemir et al., 2022);(Vygotsky, 1992). Collaborative learning is a revolutionary reform of social constructivism theory (Chiong & Jovanovic, 2012)21; (Suparlan, 2019);(Tam, 2000); (Sugrah, 2020). In the collaborative learning process, the teacher acts as a learning partner who acts as a facilitator to provide guidance, reflection, and motivation thus learning objectives are achieved (Putri et al., 2019b). Through collaborative learning, students can improve problem-solving skills, critical thinking skills, and self-reflection in an active social environment (Chiong & Jovanovic, 2012)21; (Agustin Iban˜ez, PhD Facundo Manes, MD, 2021) because collaborative learning involves students in discussion, practice, and teamwork projects that will enrich their learning experience (Nurhadiyati et al., 2020); (Junita et al., 2021). This collaborative learning

concept is very in line with the goals of the models of Projek Pelajar Pancasila in improving students' development in kindergarten.

Researchers of project-based learning models have specific steps. According to (Lucas, 2007), there are 6 syntaxes in project-based learning, the first step is determining basic questions, the second step is preparing a project plan, the third is preparing a schedule, the fourth is monitoring students and project progress, the fifth evaluating the results and the sixth evaluating the experience (Lukitasari et al., 2021).

Cognitive Development

Cognitive can be defined as the ability to learn or think or intelligence, the ability to learn new skills and concepts, the ability to understand what is happening in the environment, and the ability to use memory and solve simple problems (Kim, 2020). Cognitive itself can be interpreted as something that a child has to be able to understand something (Hasibuan & Suryana, 2021). Cognitive development also refers to the concept of problem solving, or the ability to understand something (Sugrah, 2020). Part of understanding, reasoning, understanding things and knowledge is a form of cognitive development. Part of understanding, reasoning, understanding things and knowledge is a form of cognitive development. Development is a basic potential that must be stimulated in kindergarten children because this will be related to how children grow with good personality and character (Fahruddin & Astini, 2018); (Hendrowibowo & Kristanto, 2024).

Cognitive development in children must be explored in the elements of the Pancasila student profile, such as: (1) faith, fear of God Almighty, and noble character, (2) global wisdom, (3) mutual cooperation, (4) independence, (5) critical reasoning, and (6) creative. However, the problem found by researchers during initial observations at Yadiaksa IT Kindergarten was that the cognitive aspects of the elements of mutual assistance, critical reasoning and creative children were very low. Therefore, researchers only looked at the cognitive aspects of these three elements.

1) Syntax: Syntax is the sequence of activities and phases of learning. Syntax becomes a reference for teachers and children in the application of learning models when learning activities take place
2) Social System: In the social system element, the role of the teacher's relationship with children and the underlying norms. In this aspect, the teacher is the center of activity, a source of information or can be called a high-structured activity, or it can also form a balanced activity between the teacher and the child (moderately structured activity). In this case, children are certainly considered as centers of activity to enhance their respective roles or roles and intellectual freedom
3) Reaction Principle: The reaction principle concerns what a teacher does in appreciating, responding and placing everything according to what a child does during learning. (Arends, 2009).
4) Support System: The support system is a means or tool and device needed to support the application and implementation of the learning model
5) Accompaniment and Instructional Impact: Instructional and accompaniment impacts are impacts obtained directly in the learning process (achievement of expected goals), accompaniment impacts are the results of other lessons as a result of the application of the intended learning (Arends, 2009).

Based on what is explained above, we can draw a conclusion that the model is a plan, step, and situation that must be achieved for the realization of learning objectives. The syntax has been adjusted to the age and developmental stage of children aged 5-6 years, each syntax will create interaction between educators and children (Habibi et al., 2020a). Children and learning media used have been adjusted to the characteristics of the PjBL model (Sari et al., 2023). Here's the development of PjBL syntax and then researchers adapt previous expert findings, as seen in the table below.

Table 1. PjBL Syntax According to Experts and Researchers

Fase	Lucas (2007)	Doppelt (2005)	Laboy-Rush (2010)	(Sari et al., 2024)
1	*Start With Essential Question*	*Design Purpose*	*Reflection*	*Question*
2	*Design Project*	*Field of Inquiry*	*Research*	*Ignite Knowledge*
3	*Create Schedule*	*Solution Alternatives*	*Discovery*	*Design Plan*
4	*Monitoring the Students and Progress of Project*	*Choosing the Preferred Solution*	*Application*	*Create Schedule*
5	*Assess Outcome the*	*Operation Steps*	*Communicatio n*	*Monitoring*
6	*Evaluation the Experience*	*Evaluation*		*Assess the Outcome*
7				*Evaluation the Experience*

The syntax results of table 1 are then adapted to this study and then modified can be seen in figure 3 below.

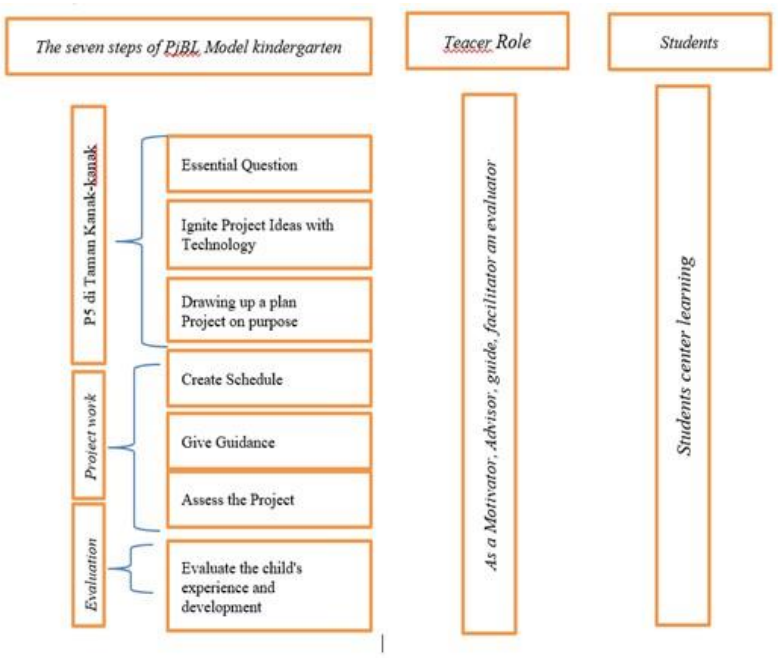

Figure 3. *The Seven of PjBL Model*

Based on several syntaxes of the Project Based Learning model, researchers conduct an analysis and study of the advantages and disadvantages contained in the syntax and then serve as a basis for developing an effective Project Based Learning model syntax for children's cognitive development.

The syntax of the Project Based Learning model based on educational games for children's cognitive development in kindergarten developed is shown in Figure 10. The PjBL model designed above has been validated by five experts or validators with a validity rate of 90.3%. Meanwhile, from the practicality test tested by practitioners of the PjBL model with 7 steps, it is practical to be used by kindergarten children with a practicality level of 87%. At this time researchers conducted a study to see how effective this model is in improving child development on cognitive aspects.

Early Childhood Education

Early childhood education aims to guide, stimulate, stimulate and provide opportunities to grow and develop according to the child's age stage (Rakimahwati & Hanifah, 2022). The focus of early childhood education is developmental stimulation, in this case there are six aspects of development that must be stimulated, the development of religious and moral aspects, Pancasila students, cognitive, motor, social emotional, and language (Sari et al., 2023). Education in kindergarten is the basic foundation for children entering the basic education level, this is an effort to foster a golden age. Through providing stimulation and direct experience to children, in this case educators should provide various activities that are able to stimulate these six aspects of development(Sari et al., 2023). Early childhood education is a vehicle for instilling concepts in children (Putriani, Jesicka; Hudaidah, 2021).

Early childhood education aims to develop the potential of children from an early age as preparation for life in the future (Rakimahwati & Roza, 2020), Childhood education supports children's growth and development. Another purpose of early childhood education is to facilitate child development and obtimal growth so that they grow into independent children who are able to solve problems, creative, active and can improve human resources in the future (Hasanah, 2019). Furthermore, education in kindergarten also facilitates the growth and development of children as a whole and comprehensively, emphasizes all aspects of personality and is able to develop positive behavior of children and children's personalities (Kristanto & Wibowo, 2023).

METHODOLOGY

Research with pseudo-experimental methods uses a two-group design that focuses on the theme "I love the earth" with sub-themes of caring for the environment and planting. The study population was 40 children. With a total of 20 children as a control group and 20 children as an experimental group using the PjBL learning method.

The difference in the treatment of the two groups lies in the syntax used. Eggen and kouchack (2012) describe syntax or procedure as a step or stage that helps in achieving learning objectives. To see the syntax of the two classes can be seen in table 2 below:

Table 2. Differences in the syntax of experimental classes and control classes

Control Class	Experimental Classes
Stages	**Stages**
1. The teacher determines the theme and designs the project sub-theme 2. The teacher explains the themes and sub-themes to the children and provides explanations to parents for the project to be done 3. The teacher sets the time for the implementation of the project 4. The teacher sees the process of working among children in the group and the involvement of parents in preparing materials 5. Teachers collect projects 6. The teacher evaluates	1. Essential questions 2. Igniter knowledge ideas through technology or educational games 3. Develop a project plan 4. Create project schedule 5. Guiding children when carrying out projects 6. Assess project results through Percentages 7. Evaluate the experience and development of the child.

The assessment of cognitive abilities in kindergarten is divided into three parts, namely: problem solving, logical thinking and symbolic thinking. Assessment of student development is carried out using authentic assessment. The observer will assess the child when solving problems using a score range of 1 to 4. The instruments used to assess children's cognitive abilities can be seen in table 3 below. Table 3. Aspects of Cognitive Assessment

No	Assessed aspects	Learning Outcomes
1	Learning Problem Solving	The child is able to identify problems Children are able to determine solutions to solve existing problems
2	Logical Thinking	Children are able to understand different similarities Children are able to understand the concept of connecting Children are able to calcify objects based on shape, size and color. Children are able to understand cause and effect Children are able to express opinions
3	Symbolic Thinking	Children are able to recognize symbols Children are able to know the use of symbols Children can present objects in the form of works with confidence and class

The Assessment Criteria are based on the 2022 independent curriculum learning and assessment guidelines with the following conditions:
-Newly Developed (0-40%)
-Qualified (41-60%)
-Competent (61-80%)
-Proficient (81-100%)

Before conducting a child's cognitive development test, researchers must perform an analysis requirements test, normality test and variance mitogenicity test. The experimental data analysis test uses the T test to compare the cognitive development of children in the experimental and control groups. This is necessary to prove the hypothesis that there are significant differences in children's cognitive development in the two groups after being treated and those given the group task shown with sig. (2-Tail) less than 0.05.

RESULT

The results of the assessment of children's cognitive skills are obtained from the observation of these skills during the learning process and based on the child's process in using educational games. Problem-solving skills are assessed when children perform analysis activities from question-and-answer questions with teachers and use educational games. While logical and symbolic thinking skills are assessed when children discuss with teachers and friends in designing and setting project schedules. Furthermore, symbolic thinking skills are assessed based on the ability of children to carry out educational game activities and present their work. Data obtained from cognitive skill assessment instruments are used to determine the achievement of these skills after children carry out learning activities. Data on the results of the assessment of children's cognitive development can be seen briefly in table 4.

Table 4. Results of the Assessment of Children's Cognitive Development

Meeting	Problem Solving		Logical Thinking		Symbolic Thinking	
	Control	Experiment	Control	Experiment	Control	Experimen
1	75,5	88,33	79,66	89,66	74,44	87,22
2	76,33	89,16	70	91,66	79,44	90,55
3	70,66	93,33	72,33	82,33	70	92,22
Average	74,16	90,27	73,99	87,81	74,62	89,99
Category	Competent	Proficient	Competent	Proficeint	Proficient	Proficient

Based on table 4, it is known that the average problem-solving aspect in control class children reached 74.16 and experimental class children reached 90.27 with consecutive class categories, namely competent and proficient. Furthermore, in the aspect of logical thinking, the average control class child was 73.99 with a competent category and experimental class children reached 87.81 with a proficient category. In the aspect of symbolic thinking, the average percentage of control class children reached 74.62 with the competent category and experimental class children reached 89.99 with the proficient category.

Based on the data from the assessment of children's cognitive development after using the Project Based Learning model showed significant improvement with proficient achievement criteria that are exemplary. The interpretation of the assessment of children's cognitive development is carried out to determine the achievement of each cognitive skill that has been proficient by children.

The first stage in the syntax of the PjBL model, presents the surrounding phenomena directly in order to trigger children's initial knowledge with essential questions based on phenomena in the surrounding environment. This greatly affects the child's learning motivation to answer the teacher's questions and understand what the problem is. At this stage the teacher as a motivator displays concrete phenomena related to the theme to be studied, thus making children more interested in solving problems in the environment, this can be seen in figure 4.

Figure 4. . Children's Activities When Constructing Initial Knowledge with the First Syntax, namely Star With Essential Questions by showing problems around

In figure 4 above, the teacher's child sees a dirty environment and an unused environment. By looking at the phenomena around, teachers can ask children about these phenomena. For example: "To clean the environment what do we need?", "If there is untapped land what should we do?". This is the essential question that can be raised. At this stage, children will be active in understanding the surrounding environmental phenomena related to the theme "I Love the Earth" to be studied.

In the second syntax, namely Ignite Knowledge Through Technology. Games that aim for learning activities can be referred to as educational games or educational games. The role of games in PjBL is to spark knowledge of what projects can be done and how to do them. Children's initial knowledge built on surrounding phenomena will encourage children's creative and innovative thinking skills in understanding and solving problems related to the theme studied. The use of educational games can be seen in figure 5 below.

Figure 5. Children's Activities When Playing Educational Games Related to "Maintaining Hygiene" and "Gardening"

The third stage of the model syntax is Design A Plan For The project. Planning is done collaboratively between teachers and children. Thus, children are expected to feel "ownership" over the project. The fourth stage is Create A Schedule. Teachers and children collaboratively set the time for the implementation of activities in completing the project. Activities at this stage include: (1) the teacher makes a schedule to complete the project, (2) the teacher determines the final time for completing the project, and (3) the teacher takes the child to plan a new way. The schedule that has been agreed upon by the teacher and child is also confirmed to parents, the schedule must be mutually agreed so that the teacher can monitor learning progress and work on projects outside the classroom.

The fifth stage in the syntax of this model is Monitoring. The teacher is responsible for monitoring the child's activities during the completion of the project. Monitoring is carried out by facilitating children in each process. In other words, the teacher acts as a mentor for children's activities. In order to facilitate the monitoring process, a rubric was created that can record all important activities. This stage can be seen in figure 6.

Figure 6. Teacher Activities Monitoring Children During Project Implementation

In figure 7, it can be seen that children are actively involved in project activities. In this activity, it can be seen that children are encouraged to collaborate with each other in carrying out their activities.

In the final stage or stage 7 the syntax of the Project Based Learning model is Evaluate The Experience. At the end of the learning process, teachers and children reflect on the activities and results of projects that have been carried out. The reflection process is carried out both individually and in groups. At this stage the child is asked to express his feelings and experiences while completing the project. This activity can be seen in figure 8.

Figure 8. Children's Activities During Project Results Presentation
(Expressing their feelings when making projects)

In figure 8, it can be seen that the child presents the results of the project in front of the class. At the beginning of learning, children are still shy to appear in front of the class. However, after being given motivation, the child finally dared and confidently appeared in front of the class. With the child's ability to explain the results of his discussion in front of the class and present his best results, it will further improve children's cognitive skills.
Based on this presentation, the project-based learning model can indirectly develop various cognitive skills in children, and change the learning atmosphere to be interesting and fun. This model also provides real experience to children to solve existing problems.

DISCUSSION

The Seven Steps PjBL model to improve children's cognitive in kindergarten was developed as one of the platforms in developing important skills of the 21st century. The effectiveness of the seven-step PjBL model can be seen from the increase in cognitive development which consists of indicators of problem solving, logical thinking and symbolic thinking. The average percentage of problem solving has reached 90.27, logical thinking has reached 87.81, and symbolic thinking has reached 89.99. The results of the data analysis showed that children's cognitive skills in the three aspects assessed showed significant achievement with categories exceeding the standard (very good).
The project-based learning model positions children as active learning subjects through project activities. As an active learning subject, children will be able to explore their abilities and learning environment optimally so that learning becomes more fun and meaningful for children. Active learning leads children to play an active role in learning activities. The main characteristic of active learning is that teachers act more as motivators, facilitators, mediators, and evaluators who provide space, situations or learning environments that make children active in learning activities. The project-based learning model was developed as a form of meaningful learning so as to facilitate children in children's cognitive development which is one of the parameters of the effectiveness of the learning model. The implementation of a 7-step project-based learning model for children's cognitive development applies collaborative learning. According to Davier et al., (2017) collaboration in project-based learning is characterized by interaction between two or more children who share ideas, experiences and negotiate in developing children's skills. Learning collaboratively will improve children's cognitive skills. It is evident from the results of effectiveness tests that project activities and children's attitudes are able to improve children's cognitive skills which include problem-solving, logical thinking, and symbolic thinking skills have exceeded the standard (very good).

CONCLUSION

Based on the results of the research that has been done, it was concluded that the results of the design stage obtained a project-based learning model design for children's cognitive development in kindergarten with seven syntaxes which include: 1) Star With Essential Question; 2) Ignite Knowledge Through Technology; 3) Design A Plan For The project; 4) Create A Schedule; 5) Monitoring; 6) Assess The Outcome; 7) Evaluate The Experience. The learning model is designed by accommodating cognitive skills, namely: 1) problem solving; 2) logical, creative &; critical thinking; 3) Symbolic thinking. The social system is designed by emphasizing the role of teachers as motivators, facilitators, mediators, and evaluators, while children act as learning subjects, the reaction principle built in the learning system is student center learning.
The results of the analysis of model validity are relevant to very valid criteria, then consistently, in accordance with the characteristics of children in kindergarten who are in the stage of preoperational cognitive development where children are able to begin to represent the world with words and pictures. These words and images indicate an increase in symbolic thinking and transcending the relationship of sensory information and physical action. In addition, children have also been able to develop social interaction both in collaborating and communicating, so that the resulting products are effectively used. The results of the model practicality test analysis based on observations of learning implementation were obtained with very practical criteria. Thus, the developed model can be applied under normal conditions, and can be applied by teachers and children. Project based learning model through descriptive analysis, effective to improve children's cognitive skills.
The results of the research developed above can be seen that the development of project-based learning models is very valid, practical, and effective in improving children's cognitive skills. This model makes learning more interesting and meaningful because this model not only develops aspects of knowledge, but most importantly is able to develop cognitive skills and generate children's learning motivation. Through this model, teachers also play an active role in facilitating children according to the characteristics of project learning. Through project activities by presenting the real world, making learning more meaningful for children so that cognitive skills can be explored optimally. Through this model, especially children's cognitive skills will be better, because in this model children are given the opportunity to construct ideas in designing projects, collaborate with group members in problem solving, hone communication skills effectively and encourage children's creativity in thinking and innovation in problem solving. For this reason, teachers are expected to implement a project-based learning model for children's cognitive development in kindergarten can be used as an interesting and fun learning model because it is adapted to the characteristics of children in kindergarten.

Some limitations of this study can affect its results. Research limitations include time constraints, respondent characteristics, and the use of methods in applying the project-based learning model. The measurement of respondents' characteristics in this study focuses on the teaching experience of teachers who apply the projectbased Learning model so that guidance and understanding are needed, and project-based learning practices in learning can be understood by teachers and students in the classroom. The scope of this study was limited to early childhood in a few schools in a district in West Sumatra, Indonesia. Another obstacle was the limited time to respond to fill out the available questionnaire, so respondents needed to understand the aims and objectives of learning kindergarten children—another time limitation in applying project-based learning to teachers and piloted in several schools. Therefore, the teacher's understanding of the application of project-based learning and the student's knowledge of the material delivered by the teacher has a positive impact. Additional factors that, in theory, can accommodate student needs in implementing learning through project-based learning. In addition, it can be applied and accepted in practice, as evidenced by the results of the validity and practicality test of the project-based learning model used in the classroom.

Although there are several obstacles, the results of this study have implications for other studies, especially research on early childhood education and governance. Research implications related to project-based learning can improve student cognition and motivation in classroom learning. The results of this study must be distinct from the role and involvement of teachers in applying the project-based learning model to students. In addition, this research has been proven to construct ideas and make learning more fun. Furthermore, this research is expected to be a significant source of information on early childhood education, especially providing opportunities for students to explore expressing creativity in learning. This study argues that there is a need for additional studies and investigations regarding the application of the project-based learning model. This research effort is recommended to involve school principals and district education offices. It is also advisable to conduct further research on government involvement in policymaking.

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