1. INTRODUCTION

Early age is included in the golden age phase where at this age children grow and develop to learn various things quickly. During this period, children not only develop physically but also developmentally, where they have the potential to learn many things to continuously improve their skills by observing and interacting with the world around them [1]. Kindergarten (TK) is one form of early childhood education on the formal path which is held as education to prepare children before entering the stage of basic education so that children can acquire good knowledge, skills, and attitudes [2]. Therefore, in preparing for early childhood before entering the stage of basic education,

Based on PPDB TK 2021, the lowest entry age for kindergarten is 3 years and the highest is 6 years. For children aged 3-6 years, learning is very necessary for the development of their brains and minds [3]. Therefore, early childhood education requires the role of educators to help the growth and development of children. In learning in kindergarten there are several problems, where at the age of 3-6 years a different way of learning is needed from elementary school-aged children [4]. Based on the results of a survey conducted on teachers at Yos Sudarso Kindergarten, Purwakarta, it was stated that the learning method used at the school still uses conventional learning methods with little play, due to the COVID-19 pandemic which has hindered some learning activities while playing. The conventional learning method uses books and stationery as face-to-face learning media and uses Zoom as an online learning medium. The conventional learning method used still has some drawbacks because children get bored quickly with the learning material provided by the teacher, therefore the teacher provides games that make children happier to understand the learning material. This makes teachers have to be more creative in providing learning methods for early childhood so that they are more interested in understanding learning material. In early childhood, what they need is to play conventional learning methods that are less effective on early childhood learning patterns [5].

Game-based learning¬ (GBL) is a game-based learning method. Many studies prove that the use of GBL is more effective than conventional face-to-face learning methods in the classroom [6]. GBL learning methods and strategies can turn boring instructions into a more lively and active learning process [7]. In 2021, mobile phones have been used as GBL to prevent boredom in the learning process which is commonly called mobile Game-based learning (mGBL). Mobile phones are used as interactive learning media because they are easier to carry everywhere and more practical to use [8].

The design of the GBL application requires testing requirements and evaluations to adapt to the early childhood learning system from time to time [9]. Therefore, the method used to determine the need for this application is the Children-centered design method. The children-centered design itself is a method adapted from the user-centered design method where designers place children as the main object in developing a product [10]. Tests were carried out using Quality in User Integrated Measurement (QUIM) as an evaluation method. QUIM is used because there are dynamic factors, so it can be used as needed, namely learnability in accordance with the background of the problem [11].

There are several related studies that are similar to this research, including "User Interface Model of Jigsaw Puzzle Based on User Experience on Early Children with Children-Centered Design Methods" by Hafidz Noor Fauzi, Veronikha Effendy, and Danang Junaedi. Hafidz explains about how to make user interface model of jigsaw puzzle based on user experience on early children. Hafidz creates a game application in mobile devices because mobile device is easy to use [1]. The second related studies is "User Interface Model for Learning Daily Prayers According to User Experience Early Childhood Using the User Centered Design Method" by Luthfi Lisan Shidqi, Veronikha Effendy, and Anisa Herdiani. The author examines how to design user interface model for learning daily prayers with mobile application because mobile phone is because it's easier carried everywhere and more practical [8]. The third related studies is "Kids Learning Educational Games as Basic Learning Media for Early Childhood based on Android" by Wanty Eka Jayanti, Eva Meilinda, Nana Fahriza. The author examines how to make educational game for early childhood with attractive look and easy to use so the user interested to play this game [5]. The next research is "Game-based Learning as Innovation and Acceleration Solution Adaption Learning in The New Normal" by Aisyah Cinta Putri Wibawa, Hashina Qiamu Mumtaziah, Lutfiah Anisa Sholaihah. The author make GBL as innovation for learning because GBL can make learning more effective [12]. The last research is "Application-based Gamification and Early Children's Learning" by Tsali Tsatul Mukarromah, Putri Agustina. The author explain about gamification for early children because gamification with application-based is solution for early children learning where it can develop skills in children such as cognitive skills, language, and can increase motivation, learning participation, and cooperation [13]. Therefore, this study aims to analyze and design GBL as a technology-based early childhood learning method.