

# Play Traffic Simulation in Interactive Surface for Early Childhood Education

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*Abstract-Playing traffic simulation is a multimedia software that provides early childhood learning activities in the classroom to instill traffic discipline especially in early childhood. The software is run by a computer and the resulting image is a road simulation along with traffic signs that are projected onto a surface by an LCD projector. The computer interacts with users through the Infra-Red LED installed on a toy car and the light is captured by WiiMote. The results of the development are valid criteria through expert trials of learning activities for early childhood and the media. At the time of field testing limited to one kindergarten, the result was that children loved it and were very interested and scrambled to play it. While the teacher responds positively and is interested in the traffic simulator, with a note that the security factor of device placement needs to be considered, also the skills of the teacher in preparing the device to become a separate obstacle in its utilization.*

**Keywords:** *traffic simulation, interactive surface, early childhood, education*

## I. INTRODUCTION

In general, playing traffic is one of the learning activities in Early Childhood Education. The findings of previous studies revealed that playing traffic simulations with role-playing can change attitudes and modify traffic safety behavior at that age (Renaud & Suissa, 1989). Activities are carried out to instill the discipline of traffic as early as possible so that children can apply them in people's lives later. This statement is supported by research that there is a very strong relationship between the development experienced by children at an early age and their success in later life (Kemdikbud, 2019). In addition to managing traffic discipline, the potential of intelligence that can be developed through this activity is kinesthetic intelligence where visuals will coordinate motor movements, especially gross motoric. This is consistent with the primary function of early childhood education is to develop all aspects of child development that include cognitive, language, physical (gross and fine motor), social, and emotional. This aspect of development is also stated in Permendikbud number 146 of 2014 article 5, namely about its curriculum and development programs (Kemdikbud, 2014).

This activity usually takes place outside the classroom which aims to instill the discipline of traffic from an early age. Some schools have a traffic play park independently, some use facilities provided by local governments and some do not have them. This is due to the high infrastructure needed when building their infrastructure in addition to adequate land in the school environment as well as the necessary equipment such as toy cars that can be ridden. If students are taken outside the school environment to take advantage of local government facilities, it will require less time so it is not efficient. Indonesia's climate is a problem in itself when rainy days will be postponed outdoors.

These problems have an impact on planned learning activities. For this reason, an alternative is needed so that traffic play activities are carried out even though the school has limitations and weather that do not support learning outside the classroom.

Simulation is a representation of an event in the real world or imitation of events in the real world. Educational simulation is a model of several phenomena or activities that users learn through interaction with simulations (Alessi & Trollip, 2001). Educational simulation is one type of multimedia that is used for learning. Multimedia simulation can also be said as a method for learning that is interesting and motivating than other methodologies, better by using computer technology and more like learning in the real world.

According to Article 1 of Law No. 22 of 2009, traffic was defined as the movement of vehicles and people in the road traffic, while the space road traffic is the infrastructure that is destined for the motion to move the vehicle, people and/or goods in the form of the road with supporting facilities (Republik Indonesia, 2009). Thus traffic can be interpreted as moving motion activities that occur on the road with supporting facilities. Traffic signs are one of the supporting facilities that are used to order traffic.

Traffic simulations can be interpreted as an imitation of moving motion activities that occur on the road with supporting facilities. To imitate real events about traffic, real-world imitations are needed. Imitation developed is road traffic space, vehicles that are moved by users in traffic space, and traffic signs as road support facilities.

The interactive surface is defined as an interactive surface where the user can interact with any surface which is then responded to by the system. Interactive surfaces provide opportunities for users of educational simulations to interact with real-world imitations. Michael Evans and Jochen Rick argue that natural interfaces provide a unique opportunity for designers to support collocated collaborative and kinesthetic learning experiences (Evans & Rick, 2014). Previous research shows that interactive surfaces can be used to learn fine motor skills (Purwodani & Soepriyanto, 2017). Thus the interactive surface provides an opportunity for students to interact naturally with the subject matter presented and kinesthetic learning experiences. As previous research that interactive surface

The interactive surface is an Interactive Whiteboard (IWB) where this technology combines LCD projectors and computers with boards that can be touched to control and application programs running on the operating system. On the market, there are various kinds of interactive touch board models, one of which is SMARTboard, which is very expensive for a school institution. In general, when buying the device, a board, LCD projector, connectors connected to the computer and the software are run and to control the interaction with the board through the stylus connected to the software.

For IWB devices used are the designs of Johny Chung Lee that are more affordable. The design began in 2008, along with the many users of Nintendo game equipment with its Wii console. The controlling device for the game console is WiiMote (Wireless Remote) which accepts interaction through the InfraRed receiver and sends the reception signal to another device with Bluetooth.

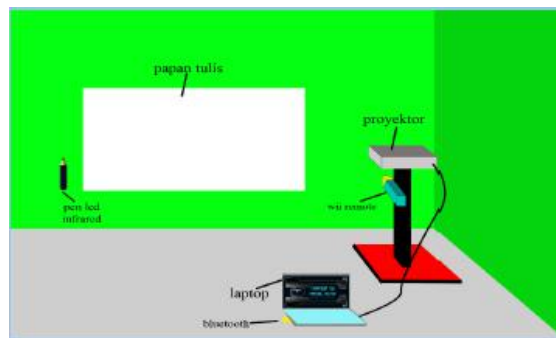


Figure 1. Placement of IWB devices (J. Lee, 2008)

The design consists of several main devices, namely white whiteboard, WiMote, Bluetooth dongle, InfraRed pen, projector, computer or a type of Laptop/notebook, as well as the interaction control software installed on the computer. Placement of the main device shown in Figure 1, WiiMote is placed towards the board with an Infrared (IR) sensor facing the whiteboard. Bluetooth dongle is plugged into a USB port of a computer that has installed interaction control software and LCD Projector. The IR pen is used as a tool for interaction with the whiteboard.

Overall the cost required is no more than \$ 150 or Rp. 2,000,000 (IDR 13,300 / \$ 1) assuming the projector and computer are already in the classroom as standard learning facilities. For device control software using Johny Chung Lee's design which is free and open source. Thus this design is cheaper compared to the IWB which was mass-produced by a device development company.

For development, Johny Chung Lee's design changed the projected position as shown in figure 2. The projection which initially on the whiteboard on the wall was diverted to the floor surface so that it could be played together by students and images that resembled the original even though they were simulated.

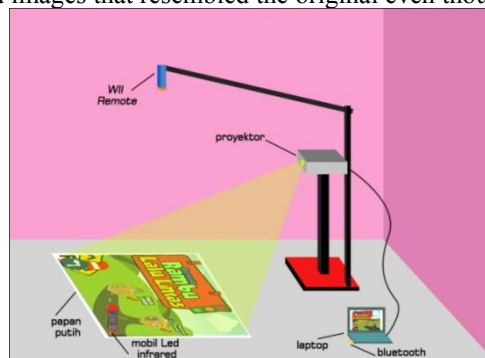


Figure 2. repositioning the IWB device

II. METHOD

For the development of traffic simulation software using the development model Lee & Owen (2004). This development model is suitable for software developed in the form of multimedia applications (Lee & Owens, 2004). The model starts from an analysis that contains needs assessment, front-end analysis, design, development, implementation, and evaluation is a cyclic and continuous process as shown in Figure 3.

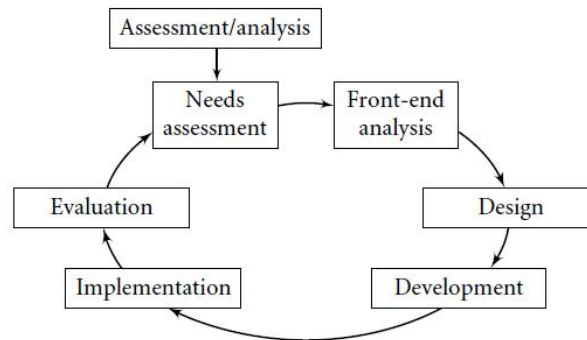


Figure 3. Lee - Owen's Development Model (2004)

There are four stages in implementing the Lee-Owen development model, namely the stage of analysis/assessment, design, development, and evaluation. The analysis phase consists of needs assessment and front-end analysis. The design and development and implementation phases include schedules, teams, multimedia development, components of general development, development of computer-based learning environments. The evaluation phase consists of two, namely formative and summative evaluation. This stage has not been carried out, considering this development is still being tested on a laboratory scale.

The needs assessment is a systematic process of goal setting, identifying differences between actual and desired conditions, and setting priorities for action. Thus the gap that occurs can be identified properly. The results of the needs analysis show that traffic activities need to be carried out but the obstacles are the development of expensive infrastructure, inadequate land size, weather conditions that do not allow for outdoor activities.

Front-end analysis is a set of techniques that can be used in a variety of combinations to help bridge the gap by setting the desired solution. The analysis consists of audience analysis, technology, situations, tasks, important events, goals, problems, media, existing data, and costs. For this development only carry out several analyzes unless cost analysis is not carried out.

Audience analysis provides results that the audience is in early childhood. Thus it will affect the overall layout design both in shape, image, and color. Learning material software installed in the form of applications that support the process of learning traffic. For this reason, in the analysis of the situation, it is obtained that the simulation application program is carried out for learning in a situation of a room measuring at least 3 x 5 meters, with the lighting adjusted by the power of Lumens from an LCD projector.

In utilizing traffic simulation software, early childhood will play on a projected surface of the simulation display. Students move their toy cars across the road, then some signs must be obeyed. If the sign is violated, the software will respond with visual and audio symbols. If students arrive at a place that has been determined by the software, it will get an appreciation in the form of a symbol on the display, the teacher and his friends. Thus the results of the analysis of the task are to get knowledge about concepts and principles in traffic so that the learning outcomes obtained are cognitive, affective and psychomotor.

For critical incident analysis results in learning activities traffic is traffic discipline knowledge represented in the form of pictures or symbols as well as audio, in addition to the teacher explains how to use it. While the road map, the name of the road is important but not necessary, and in simulation software is not necessary and not important, it also explains the overall simulation software.

The purpose of traffic learning activities is to introduce basic traffic signs to children, as well as train fine and rough motor systems and foster traffic discipline. So that the indicator is that the child can control the toy car based on the road and signs installed on the display of the simulation software projected on the surface.

From all previous analyzes, several issues have been identified, including introducing traffic signs, playing with traffic simulation software projected on a surface and preparing the infrastructure by the teacher.

The issues of concern in the development of software, so take caution and thoroughness in its development to achieve the expected goals.

From the problems described earlier, it can describe the appropriate media in learning by using multimedia software traffic simulation with the help of interactive boards. The main focus in this development is on traffic simulation content so that the media used for the introduction of visual or audio images or symbols.

The entire contents of the software are self-developed because based on the extant data analysis does not get results at all according to the results of previous analysis. Thus the development of traffic simulation software starts from the beginning (raw material) to the end (finished software products). So starting from graphic images in the form of road maps, simple signs to the interactivity design.

The next stage is the formative evaluation stage, which is carried out to test the feasibility and validity of the development results. Evaluations are made to media experts, material experts and audiences who will use them. After being tested for validity and feasibility, then the media was revised and adjusted to the advice of media experts, material experts, and users so that a decent and valid media was obtained and the audience's response. Material experts are selected from kindergarten teachers with more than 10 years of teaching experience with the latest master's education specifications. For media experts selected from Educational Technology lecturers who have more than 10 years experience to review graphic products. Responses from learning experts with the final doctoral education specifications in the Department of instructional technology.

### III. RESULTS AND DISCUSSION

The result of the development is a simulation software playing traffic that is displayed through an LCD Projector. The display is in the form of a road simulation image with a supporting device projected onto the floor as shown in Figure 4. Users interact on the display of the projection results through a modified toy car to emit infrared light. The Infra-Red beam is captured by the receiver, WiiMote, which is streamed to the computer to get a response. The results of data processing are the position of the car and the response of traffic behavior displayed on the simulation screen.

Feasibility tests from media experts and material experts are submitted in the form of questionnaires that are assessed and accumulated. The accumulated results are justified by referring to the criterion-based evaluation from Arikunto (Arikunto, 2010).

Material experts provide valid categories with an average percentage of 95%. The composition of the highest validity items is obtained from packaging, instructions, image clarity, audio clarity, interactivity level, smoothness of the sensor, the level of ability of the game, and the ability to motivate students. Whereas a sufficiently valid category is given by the material expert on the material suitability points with the learner's initial knowledge and the security of hardware placement.

Media experts provide quite valid criteria on three points, namely the level of security, the suitability of the media with the characteristics of student learning and the smooth use of interactions on the surface. For items of interest, instructions, interface compatibility, color themes, image clarity, accompaniment music, intercity, the attractiveness of interactive surface use, smoothness of sensors, innovation and the level of ability to motivate valid criteria. Thus the traffic simulation software with the help of interactive surfaces including valid categories.

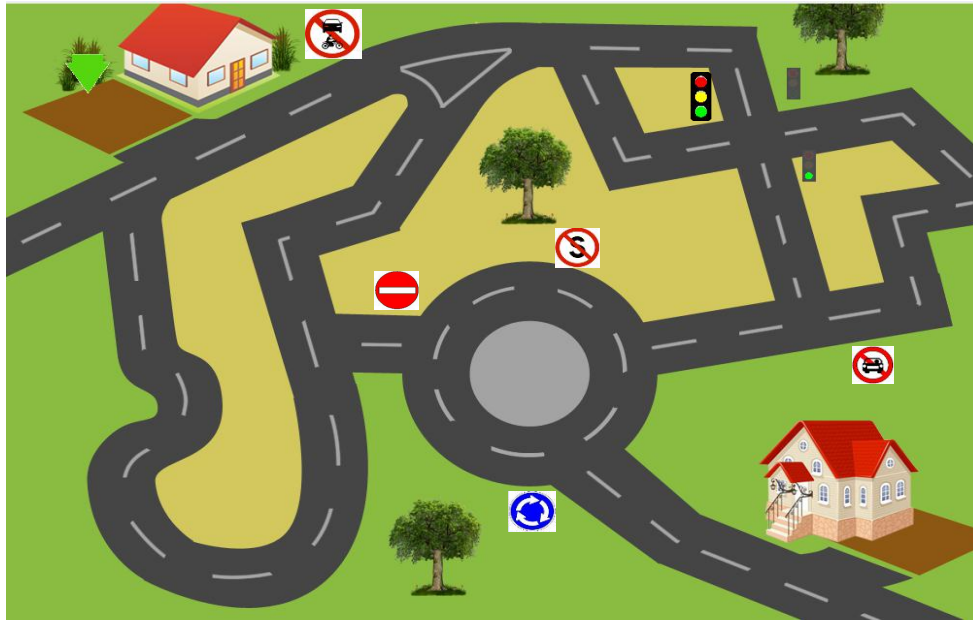


Figure 4. Display of road simulation images and supporting devices

Responses from learning experts that this traffic simulation software can be used for early childhood learning activities. There are some notes from experts that the security of device placement needs to be considered, considering early childhood tends to be active or move around the room. The next note is for the installation of hardware, initial setup, use of software and completion of the use of the software requires intensive training considering the technology used is quite complicated.

For the audience response, in this case, early childhood is quite good, because it is very enthusiastic about playing the toy car on an interactive surface. Motivation in learning activities is also very high because always asking to go back to playing the simulation. Sometimes disappointment from students because the software does not respond to the results of its activities. This is because the LED beam on the toy car is blocked by the child playing to be captured by a sensor placed above his head as shown in figure 5.

Overall software is indeed feasible to be used as a learning activity through early childhood play. Some things need to be considered in playing it both from the teacher and students, especially on the security of the placement of hardware and the placement of sensors. Referring to the problem, it needs further development so that it can be used safely and become an alternative in indoor traffic learning activities.



Figure 5. Users test the system

#### IV. CONCLUSION

Playing traffic is an activity that is generally implemented in early childhood education to foster discipline. This activity is usually carried out outdoors by imagining the real world about traffic. But the problem faced is that not all kindergartens have adequate facilities in providing it.

The development carried out can provide an alternative to kindergarten schools that have limitations in implementing it. Playing traffic can be played indoors using traffic simulations on interactive surfaces.

By utilizing the IWB technology produced by Johny Chung Lee, the modified projections were placed so that the projection display results in the Interactive Surface. Traffic simulation has been successfully developed and declared valid and can be used as a tool for early childhood learning activities. Likewise the audience's response to the use of the game and its interactive surface. Although there are still obstacles both teachers are not used to preparing, and running the software. The safety factor in the placement of devices is one of the concerns by media experts, materials and learning experts.

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