

Snake and Ladder Game for Eye Health Promotion: A Development Research

Hanna Nurul Husna*, Andika Khalifah Ardi
 Optometry Department
 STIKes Bakti Tunas Husada
 Tasikmalaya, Indonesia
 *hannanurulhusna@stikes-bth.ac.id

Abstract—Objectives: The aims of this study were to developed snakes-and-ladder game as an eye health promotion. **Method:** A research and development (RnD) method was conducted in this study, adapting ADDIE development model which consist of analysis stage, design stage, development stage, implementation stage, dan evaluation stage. **Result and Discussion:** The content that integrated into the game were healthy eye tips, eye exercise, refractive disorder, proper way of reading, eyestrain, and eye-care health officers. The aptness of the game was carried out by three expert. The result were 91% valid by media expert, 82% valid by health promotion expert, and 46% by eye health-content expert. **Conclusion:** The eye health snake-and-ladder games had revised and ready to be tested in limited and field trial as an eye health promotion media.

Keywords: snake-and-ladder game, eye health, health promotion

I. INTRODUCTION

Eyes are one of the five senses which are important in human lives. However, if the eyes are not protected, they will further cause visual impairment. According to WHO (1) visual impairment in the world was mainly caused by uncorrected refractive errors (53%), unoperated cataract (25%), and macular degeneration (4%). This was compounded by the fact that Indonesia was the second highest rank in the world after Ethiopia in terms of blind prevalence and visual impairment (2). Moreover, this was supported by the result of Blindness Survey *Rapid Assessment of Avoidable Blindness (RAAB)* in 2014-2016 which was conducted in 15 provinces in Indonesia. It indicated that the main causes of visual impairment and blindness were cataract, about 70-80%, and refractive disorders for about 10-15% (3).

Refractive disorder is a kind of visual impairments in which somebody cannot see either close objects or distant ones clearly. According to WHO (4), approximately 19 millions of children under age 15 experienced visual impairment. Surprisingly, 12 million of them suffered from refractive disorder, whereas this visual impairment was easy to diagnose and correctable.

To solve this problem, the Government through the Ministry of Health, launched The Road Map of Preventing Visual Impairment 2017-2030 (5). This map consists of several strategic efforts, namely: 1) to ensure students with

visual impairment can be remedied; 2) to develop a more comprehensive health service for patients with diabetic retinopathy, glaucoma, and low vision; and 3) to develop a comprehensive and inclusive concept for vision rehabilitation. Supported to this map and as effort to prevent visual impairment to children, a promotion of eye health was conducted.

Notoatmojo (6) stated that promoting eye health can be conducted through various methods, such as lectures, seminars, brainstorming, and playing games. However, the methods which require students to actively participate are barely found. Whereas, the more students engrossed in the activity, the more information apprehended. This is supported by Makuch (6) that playing games can expand students' knowledge better than lecturing. Therefore, this study was intended to promote eye health, in which students were engaged in the activity through playing snakes-and-ladders game.

Snakes-and-ladders game is a classic game from Indian tribe. Two players or more play the game on numbered squares. The snakes and ladders on the board function as connectors for the squares. The game is played by moving a counter forward from the starting square to the end. If the counter lands at a bottom of a ladder, it can move up to the top of the ladder, but sometimes the counter slides down if it lands on the snake's head. Historically, the game contains a moral value that the progress a player made in the game represents the journey of life which sometimes ups and downs (7).

According to Tedjasaputra (8), snakes-and-ladders game is a game which corresponds to the cognitive development of children age 8-11 years in which children of these ages can undertake a game full of logics and objective rationalities, as well as game rules. However, there are several advantages students can get from learning through this game, such as creating more fun and interesting learning circumstances, and getting students to socialize with their peers (8). Besides, the game is quite challenging so that it is expected to prevent students from boring.

Various researches have been conducted in investigating the use of snakes-and-ladders game in learning activity. One of the studies was conducted by Siyam, Nurhapsari, and Benjamin (8) entitled "The Impact of Snakes-and-Ladders

Game Simulation on Gingivitis towards Conception of Students Age 8-11 Years: A Study to Students of State Elementary School Kuningan 04, North Semarang Subdistrict". The study revealed that health education through this game was quite effective in improving students' understanding on gingivitis. Moreover, a study conducted by Handayani, Lubis, and Arintonang (9) entitled "The Impact of Counselling to Islamic Junior High School Students (MTs) Al Manar Hamparan Perak Subdistrict through Snakes-and-Ladders Game on Students' Understanding of Fruits and Vegetables" also showed that there was an increase on students' understanding after the counseling was given through this game.

According to those statements above, the researcher was intended to develop this game as a media for promoting eye health to elementary students. Besides, this study was aimed to examine the impact of the media towards the rate of students' understanding on eye health. The result of this study was expected to give a representation on the development of snakes-and-ladders game as well as its impact on eye health's understanding of students age 8-11 years.

II. MATERIAL AND METHOD

A. Procedure

In developing snakes-and-ladders game as a media for promoting eye health, research and design method (*RnD*) was applied. This method was used to create new products and test its effectivity and aptness (10).

Procedural model, which describes each step to be followed to create a media for promoting eye health, was applied in this study. The development stages in this study was adapting ADDIE developmental model (11) which consists of several stages, namely analysis stage, design stage, development stage, implementation stage, and evaluation stage.

B. Data Analysis

Adapting ADDIE development model which consist of analysis stage, design stage, development stage, implementation stage, dan evaluation stage. The content that integrated into the game were healthy eye tips, eye exercise, refractive disorder, proper way of reading, eyestrain, and eye-care health officers.

III. RESULT

Snakes-and-ladders game is a classic game from Indian tribe. Two players or more play the game on numbered squares (7). The snakes and ladders on the board function as connectors for the squares. The game is played by moving a counter forward from the starting square to the end. If the counter lands at a bottom of a ladder, it can move up to the top of the ladder, but sometimes the counter slides down if it lands on the snake's head.

Based on pre-research interview conducted to health promotion team in Dinas Kesehatan Kota Tasikmalaya, there

was not any specific media on eye health promotion yet. The promotion team usually emphasized on common health issues, such as preventing stunning and *GERMAS* (*Gerakan Masyarakat Sehat – Healthy Living Community Movement*). From that situation, the researcher tried to create and develop a media to facilitate the need of eye health promotional media in the society, which is called as "Eye Health Snakes-and-Ladder Game".

This promotional media was created and developed by applying RnD (Research & Development) method in which the development stages were adapting ADDIE stages (11)

a. Analysis stage

In this stage, the problems, the needs, and availability of promotional media related to eye health were analyzed. Since the researcher determined that the subject of this study was elementary students, the materials related to eye health problems were adjusted in order to fit their level of understanding, for example the material discusses common eye problems experienced by the students.

Analysis stages were divided into two phases, namely the game analysis and problems analysis. The game analysis was carried out by obtaining the most appropriate references that already existed online, either the common game board or content-specified game board. Several links that had been cited for references were :

- 1) *Chutes and Ladder Board Game* (12)
- 2) *Snakes and Ladder* (13)
- 3) *Snakes and Ladder Board Games* (14)

The purpose of this analysis is to give depiction and insight in creating Eye Health Snakes-and-Ladder Game. Meanwhile, applying the result of this analysis stages, the researcher concluded that:

- 1) The subjects of this study were children. Thus, the media should be colorful, interesting, and children-related.
- 2) To accomplish the purpose of this study, some of the squares were filled by some information related to eye health. However, some squares were also filled with reward and punishment in order to create a more interesting learning process.
- 3) What type of content would be included in the game board?
- 4) If the squares were filled with eye health information, the picture of ladders and snakes would be smaller. Unless, the colour transparency was increased.
- 5) The game would be more interesting if the pawn were students themselves. Therefore, the game board should be printed in an enormous size. For the dice, a foam pillow dice could be used.
- 6) It is suggested that the number of squares should be limited. If the squares were too many, there would be too many information. Consequently, the size of the board would be extremely big, and students would get easily bored.

7) The rough draft of the game should be designed first.

The process of creating the media elicited many inquiries and considerations. To answer some of the inquiries, the next analysis stages were conducted in form of preliminary study.

These preliminary studies were conducted in public health centre in Tasikmalaya and Sumedang. The researcher intentionally chose two public health centres in two different towns for more varied results. The researcher carried out an interview to the Coordinator of Senses Program, while in Sumedang, the interview was conducted to the doctor in the health centre. Based on the interviews from the preliminary study, it could be concluded that:

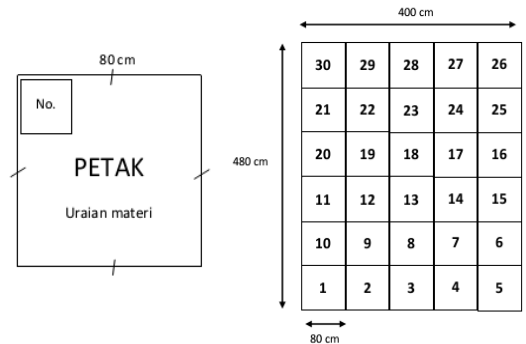
- 1) Refractive disorder that mostly found among elementary students was myopia.
- 2) Health officers in public health centre suggested a periodically eye examination. However, this could not run smoothly due to limited human resources.
- 3) Health promotion was carried out frequently, yet it was still confined to general health issues (not being specified to particular health problems, such as eye problems). The material being promoted currently was *GERMAS* (*Gerakan Masyarakat Sehat – Healthy Living Community Movement*). The promotion was commonly carried out through consultation and mass media promotion such as flyer or banner.
- 4) The materials content which could be included into the game content were myopia, healthy diet for eyes, the proper way of reading, and eye exercises.

The results from those two analysis stages were followed up by determining the contents and their relevant references. The materials that would be integrated into the game were healthy eye tips, eye exercise, refractive disorders, proper ways of reading, eyestrain, and eye-health care. On the other hand, another problem arose since literatures or previous researches related to eye health were barely found. Because of time restriction and limited personnel, the researcher chose alternative sources by getting online references. The sources were taken from trusted website as well as overseas optometry association pages, such as www.drcharlesblum.com, www.specialtyeyeinstitute.com, colorado.aoa.org, www.icarevision.com, opto.ca, cleareyesight-batesmethod.info, v2020eresource.org, page of P2PTM Indonesia Ministry of Health, and page of P2PTM Indonesia Health Department.

b. Design Stages

After conducting analysis stages, the following stage was design stage. This stage comprised designing the framework of snakes-and-ladders game, determining rules of the game, creating and validating media eligibility as instrument of the research.

The process of designing the game was accomplished in two stages: creating rough design and using software (will be described in development stage). Creating rough design is done manually using pencil and paper. It is done to give description roughly about content in every box, number, and size of box, size of board, and rule of game that will be applied. From this rough design is determined that the game would using 30 boxes consist of one box of start, 20 boxes content, 3 boxes additional moves rewards, 5 boxes questions, and one last box is finish. Size of boxes is 80 cm square and size of board is 480 x 400 cm.



Picture 1. Picture of boxes and board of snake and ladder game

Rough draft had been made, the following was determining rules of the game in which these rules were important in order to make the eye health promotion became more exciting. The results of formulating the rules of eye health snake-and-ladder game were:

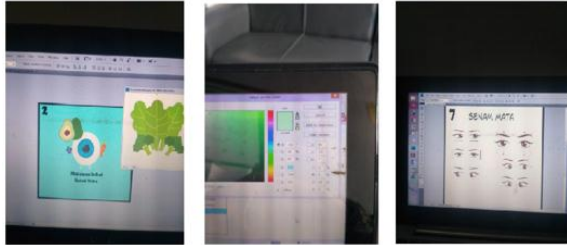
- 1) The players prepared a game board and a dice.
- 2) The players threw the dice, showed a particular number.
- 3) The players moved forward as the number shown on the dice.
- 4) If the players stopped on the “reward” square, they got additional moves as shown on the square.
- 5) If player stopped on the “question” square, they had to follow the instruction shown on the square. The reward and punishment obtained were as presented on the square.
- 6) The winner was the player who could reach the thirtieth square first.

The aptness of this media needed the involvement of third party. This aptness was aimed to assess whether the media is acceptable according to media and content expert. Questionnaires were used to validate the media eligibility. In the beginning, validating the media aptness was going to use Likert scale, but it was not implemented. The researcher needed a certain decision whether “Yes” or “No” should be applied on each square. Thus, validation sheet assessing the game board contained indicators to be achieved, sources of content, pictures of the squares, the

suitability of pictures with contents and indicators, as well as additional information.

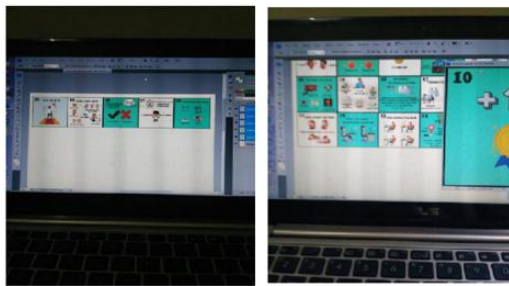
c. Development Stage

The next stage is development stage which included designing digital version of the game board using a particular software, validating the board, and 1st revision. In designing the digital version of the board, the researcher employed Adobe Photoshop CS4 software. Meanwhile, content or complementary images such as snakes and ladders were taken from free images provider such as www.freepik.com and modified as needed.



Picture 2. Process of creating snake-and-ladder game's square

There were two components in this media, namely the squares and the game board. The square was made one by one from the first square until the 30th square as drafted in the rough design. The 30 squares were then put together into the board design. Since the game was designed for young learners, the media should be colourful. Thus, the researcher chose light blue as the background colour for the board. After that, several information such as title, the designers' name and institution, logos of Optometry Department and STIKes BTH Tasikmalaya, as well as logo of Ministry of Research, Technology, and Higher Education. Four images of ladder and snakes for each were subsequently put onto the squares, in which the researcher controlled the transparency of each image so that they did not cover the information presented on the squares.



Picture 3. Process of creating snake-and-ladder game's board

The next stage was developing story board which contained the purpose of media, material, design of squares and the board, the rules, and sketch of the board with or without the images of snake and ladder. After all the components were ready, the researcher put them all together into the story board. This story board would be used as a reference in validating the aptness of this media.

Validating the aptness of the media was carried out by three experts: media expert, health promotion expert, and eye-health content expert. For media expert, Mrs Eli Kurniasih, S.Pd., S.Kep., Ners., MKM (Lecture of Health Promotion in Optometry Department) was chosen. For health promotion, staff of Dinas Kesehatan Kota Tasikmalaya was chosen. And for eye-health content expert, Mr. Arief Witjaksono, Amd.RO, SKM, MM (Lecture of Optometry Department in STIKes Darma Husada Bandung) was chosen. Researcher contacted each expert by formal letter and validating process was done consecutively.

The media was validate by media expert on June 18th 2019 and stated that 91% media was valid. For health promotion expert from Dinas Kesehatan Kota Tasikmalaya employed from June 27th – July 26th 2019 and stated that 82% media was valid. Whereas for eye-health content expert employed from July 1st – 29th 2019 and stated that 46% media was valid.













Instrument for validating the aptness of media was using two optional answer “Yes” or “Not” valid. The researcher needed a certain decision on each square. All of the expert was filled the validating sheet with “Yes” answers but there were some notes of recommendation followed for some indicator. Researcher categorized these answers as “not valid”.

All recommendations from the experts were summarized, and the results were:

- 1) Media Expert: content image should be clearer, so that it would be eye-catching.
- 2) Health Promotion Expert: the researcher should use terminologies which were easy to understand for elementary students
- 3) Eye-Health Content Expert: image of eye exercise had to be given sequence; additional information for rule 20-20-20; squares of eyestrain symptoms and back pain were removed; image of shadow creation in people with refraction disorder needed to be illuminated; vision image of people with refractive disorder was illuminated; in square describing eyestrain treatment, eye exercise was removed.

The researcher revised the media based on the recommendations above. The revisions made were:

Table 1. Revision of media based on expert recommendation

No.	Before Revision	After Revision	Revision Information
4			<ol style="list-style-type: none"> Making background color more bright Picture of "Spinach" was replace
9			An explanation was inserted below the picture "After close viewing activity"
22			<ol style="list-style-type: none"> Making background color more bright Position when the shadow fall into retina was marked using black color
24			<ol style="list-style-type: none"> Making background color more bright Term for "Myopia", "Hypermetropia" was translated by common term
26			<ol style="list-style-type: none"> Making background color more bright Picture of "Eye exercise" was deleted
29			Picture and writing of "Backache" was deleted

Having been revised, this promotion media was printed in flexi paper. Finally, the snakes-and-ladders game for eye health promotion was ready to be tested.

IV. DISCUSSION

This implementation stage comprised of limited trial, second revision, field trial, and third revision. Dealing with

limited trial, the researcher did much preparation, such as preparing the dice, producing packaging bag with certain design, formulating and providing outline for testing students' knowledge of eye health, as well as formulating questionnaires for students.

The size of dice used in this study was 10 x 10 cm. This size was chosen due to its easiness to carry. Packaging bag of this media was made with interesting design so that it would be eye-catching. The test items were not tested in limited trial, but preparation for them must done earlier. Meanwhile, questionnaires for students' assessment were made to give depiction of what students thought of this eye health promotion media.

The limited trial was implemented in Cilolohan Elementary School Tasikmalaya on Monday, August 26th 2019 from 11.30 a.m. to 00.45 p.m. assisted by two surveyors (the researcher was one o the surveyors).

Since this was a sampling, with help of the class teacher, 5 students were selected to involved in the trial. All the subjects were female. The limited trial was performed during the school hour. In the beginning, the researcher was expecting a separate room for implementing the trial. However, the teacher suggested to held it in the classroom. Thus, the limited trial was held in classroom to five students, watched by other students.

At first, students felt strange and confused with the media demonstrated by the researcher. So, the researcher encouraged them to try the game and they understood the rules afterwards. The rules had been displayed on the board, so the researcher and the surveyor only guided and oversaw the game and giving questions.



Picture 4. (a) Students' did *hom pim pah* to determined playing order; (b) Students' started the game; (c) Students' asked questions to another player; (d) Another students' show some excitement to the game

From this limited trial, the researcher found that:

- The trial that involved five subjects playing in one term seemed to be too many. Then, for field trial, the number of players played in one termin needed to be reduced into 3-4 students.
- Field trial needed more surveyor and media, because all students would actively participate in the game.
- Having finished the game, the students were required to fill the questionnaires. However, students seemed to

hardly understand each evaluation item, so that the researcher needed to explain the items in a more understandable way.

- 4) Several students refused to fill the questionnaires due to their personal reasons. For the next field trial, the researcher would ask the teacher's help to manage the class.
- 5) There was an error in the 22nd square; in that square, myopia was written as 'far-sighted', it should be written as 'short-sighted'
- 6) The images of snakes and ladder needed to be refined. When students were playing the game, those two images were frequently unnoticed by students' and surveyors.
- 7) Particular squares such as snake's squares, ladder's squares, reward squares, and question squares needed to be give more attention.

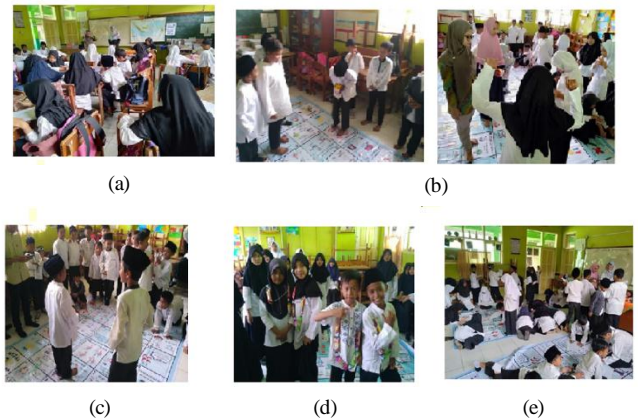
Findings related to the game were followed up by revising it. The revised game board would be used in field trial.

The field trial was carried out on Friday, August 30th 2019 to fifth-grade students in Cilolohan Elementary School Tasikmalaya. This trial was held from 10 a.m. to 11.45 a.m. During the trial, the researcher was assisted by 4 surveyors (the researches was involved as a surveyor).

Different with the limited trial, the subjects involved in this field trial were 44 students. Students were commanded by their teacher, so that they could be calm during the treatment. After classroom management, the researcher take over the class and students were completing pre-test to measure students' prior knowledge on eye health. After that, students were divided into four groups. Classroom teacher did not leave the class, she accompanied researcher and students.

Since students were already familiar with the game, they did not find any significant difficulties during the game. The game run smoothly, and the player who reached the 'Finish' square became the winner and he or she got a reward. The game was ended. The game of one group was finished if there was a winner that reaches Last Square. And then they replaced with next group.

Time goes fast. When time showed fifteen minutes to bell, game was stopped and researcher started a post test to evaluate students' knowledge about eye health. Post test is done by students. After ten minutes passed, paper is collected. For their cooperation, all of the students were rewarded by snacks.



Picture 5. (a) Students' was doing pretest; (b) Students' participated in the game; (c) Students' asked questions to another player; (d) Winner got some rewards; (e) Students' was doing posttest

Results of this limited trial were:

- 1) This game was played indoor. It is needed more spacious room so that players play game more comfortably.
- 2) Students could understand about information conveyed through eye-health snake-and-ladder game. Questions was asked by students was about eye health information that displayed on media. Students were lack of curiosity. It was revealed because no one asked about more specific eye health information.

There was not problem shown relate the media. It could be concluded that third media revision was not needed.

V. CONCLUSION

Based on finding and result of this study, they can be conclude:

1. Eye Health Snakes-and Ladder Game was developed using ADDIE developmental model: analysis stage, design stage, development stage, implementation stage, and evaluation stage.
2. The materials that integrated into the game were healthy eye tips, eye exercise, refractive disorders, proper way of reading, eyestrain, and eye-care health officers.
3. Validation the aptness of the media was carried out by experts. Those result were 91% valid by media expert, 82% valid by health promotion expert, and 46% valid by eye health content expert.
4. The eye health snake-and-ladder games had revised and ready to be tested in limited and field trial as an eye health promotion media.

There are some recommendation for further studies:

1. Profile or gain of students' knowledge on eye health can be measure by using snake-and-ladder game.
2. Snake-and-ladder game could be developed futher with another concept of health care.

ACKNOWLEDGEMENT

This study was funded by Direktorat Riset dan Pengabdian Masyarakat, Direktorat Jendral Penguatan Riset dan Pengembangan Kementerian Riset, Teknologi dan Pendidikan Tinggi Republik Indonesia Year 2019 in case of Penelitian Dosen Pemula.

REFERENCES

- [1] WHO. World Health Organization: Blindness and visual impairment [Internet]. 2017. Available from: <http://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment>.
- [2] Karfiati F. Pusat Mata Nasional Rumah Sakit Mata Cicendo Bandung [Internet]. Available from: <http://www.cicendoeyehospital.org/index.php/beranda/605-peringkat-iv-dari-60-peserta-diklatpim-ii-pgp-nasional.html>
- [3] Kementerian Kesehatan RI. InfoDatin, Situasi Gangguan Penglihatan dan Kebutaan. Kementrian Kesehatan RI. 2013;
- [4] Fauzi Lukman, Lindra A, C. H. Skrining Kelainan Refraksi Mata Pada Siswa Sekolah. *J Heal Educ*. 2016;1(1):76–84.
- [5] Kementerian Kesehatan RI. Menkes Luncurkan Peta Jalan Penanggulangan Gangguan Penglihatan [Internet]. 2017. Available from: <http://www.depkes.go.id/article/view/17101200004/minister-of-health-launches-road-map-to-visual-impairment-handling.html>
- [6] Sumantri D, Lestari Y, Arini M. Pengaruh Perubahan Tingkat Pengetahuan Gigi dan Mulut pada Pelajar Usia 7-8 Tahun di 2 Sekolah Dasar Kecamatan Mandiangin Koto Selayan Kota Bukittinggi Melalui Permainan Edukasi Kedokteran Gigi. *Andalas Dent J*. 2012;39(48).
- [7] Golchai B, Nazari N, Hassani F, Nasiri E, Nejad R, Jafar Z. Snakes and Ladders : a new method for increasing of medical student excitement. *Procedia-Social Behav Sci*. 2012;47:2089–92.
- [8] Syiyam SNL, Nurhapsari A, Benyamin B. Pengaruh Permainan Ular Tangga tentang Gingivitis terhadap Pengetahuan Anak Usia 8-11 Tahun. Studi terhadap Siswa SD Negeri Kuningan 04, Kecamatan Semarang Utara. *ODONTO Dent J*. 2015;2(1):25–8.
- [9] Handayani, I., Lubis Z, Aritonang EF. Pengaruh Penyuluhan dengan Media Permainan Ular Tangga Terhadap Pengetahuan Tentang Buah dan Sayur pada Siswa MTs-S Al Manar Kecamatan Hamparan Perak. *JUMANTIK*. 2017;3(1):115–23.
- [10] Sugiyono. Metode Penelitian Pendidikan: Pendekatan Kuantitatif, Kualitatif, dan RnD. Bandung: Alfabeta; 2015.
- [11] Nuryanti E. Development of Snake and Ladder Game, A Learning Media in Special Journal to Improve Student Motivation. *Kaji Pendidik Akutansi Indones* [Internet]. 2017;6(3). Available from: <http://journal.student.uny.ac.id/ojs/index.php/kpai/article/viewFile/9713/9367>
- [12] Hasbro. Chutes and Ladder Board Game. 2019. p. <https://www.amazon.com/HASBRO-GAMING-Chutes-Ladder>.
- [13] Crayons. Snakes and Ladder. 2019. p. <https://www.crayons.com.au/learning-can-be-fun-snake>.
- [14] Emanmah. Snakes and Ladder Board Games. 2019. p. <https://busyteacher.org/14667-snakes-and-ladders-boar.games.html>.