KnE Social Sciences

ICESRE
5th International Conference on Education and Social Science Research (ICESRE)
Volume 2022

Knowledge E
enriching | engaging | empowering

Conference Paper

Development of an Interactive PowerPoint for Training Early Age Athletes in Chess Openings

Fernandes[1], Supriatna[1], Yulingga Nanda Hanief[1], Ibnu Fatkhu Royana[2]

[1]Department of Sport Coaching Education, Malang State University, 65145, Indonesia
[2]Physical Education, Health and Recreation, Universitas PGRI Semarang, Indonesia

ORCID ID
Yulingga Nanda Hanief: https://orcid.org/0000-0003-2791-9845

Abstract.
This study intends to develop a product to train early-age athletes at the Malang Gajahmada Chess Association (PCGM) in the form of PowerPoints and websites. This product can assist athletes in learning and memorising chess openings, which is a useful tactic in chess games. The research approach employed is research and development. The following is the study's progression: first, analysis of development requirements by observation and interviews with up to 15 athletes. This is followed by product design and a validation test by media end material experts. Based on the results, the product is revised, and four athlete small group trials are conducted along with 11 athlete large group trials. The final products are developed based on the findings of the requirements and analysis of observations and interviews. The early-age athletes at PCGM require the chess opening exercises urgently. Based on the recapitulation findings, the material expert gave a score of 90%, and the media expert gave a 95%, indicating that it was declared valid and worthy of testing in small and large groups. The trial findings indicated that the small group trials obtained a score of 95%, while the large group trials received a score of 97.81%. The chess opening training media development product in the form of PowerPoints is particularly valid and suitable for PCGM early childhood athletes, according to validation and group trial findings.

Keywords: early age athletes; training media; chess openings

Corresponding Author: Yulingga Nanda Hanief; email: yulingga.hanief.fik@um.ac.id

Published 21 December 2022

Publishing services provided by Knowledge E

Selection and Peer-review under the responsibility of the ICESRE Conference Committee.

1. Introduction

An effort to develop and foster chess athletes is a very important process since chess is becoming increasingly popular and competitive in society in current times (Mageth, 2017). Chess athletes of many ages and its achievements are increasing in the regions, both rural and urban, and it requires coaching and development to be successful as early as possible so that they can compete at national and international levels (2). In chess training, athletes should begin as young as feasible. This training aims to identify athletes with the potential to thrive in the field of chess. Potential chess players are excellent seedlings who need to be trained. It requires discipline, awareness, patience,

and persistence to become an accomplished and experienced athlete, which is not as easy as we assume (3). Achievements are not attained in a matter of weeks or months, but rather over years, through steady gains in the outcomes of consistent effort (4).

There are numerous types of chess strategy guidebooks to play chess in today's modern period, but instruction through ineffective guides must be complemented with direct practice to check out the theories included in the material (Coulom, 2016). The development of more advanced technology and information has a very substantial and essential impact on numerous sectors of human existence, including chess (6). Chess athletes in the modern period require more media and training tools that are easy to obtain, practical, and engaging, so that athletes are not overwhelmed by the numerous theories utilized in practice. The development of chess training media, such as interactive multimedia PowerPoint as information technology to assist the training process and increase chess ability, is very essential. As a result, in chess game theory, it is vital to produce engaging training media and, of course, to make the training process simpler for chess athletes (7). Athletes can employ interactive multimedia through computers as well as cell phones, which are frequently used in daily activities. Athletes believe interactive multimedia PowerPoint could be utilized to improve chess abilities (8). In this current society, the development of interactive multimedia is still viewed as an entertaining medium. The enjoyable aspect of interactive multimedia can improve comprehension and is easily embraced by people of all ages (9). Interactive multimedia in the form of PowerPoint conveys messages or a sequence of messages on chess game strategy information utilizing the media of voice, text, and graphics (visual). As a result, it is critical to develop interactive multimedia products that can be employed as chess training material to encourage and enhance players' talents while also keeping athletes interested in the training process (10).

The developed interactive multimedia PowerPoint contains flexible qualities that enable it to be stored on Google Drive and Flash Disk. The developed interactive multimedia is in the form of a PowerPoint, which visually provides colour displays, pictures, sounds, material texts, videos, and links that could be associated with contextual information related to chess game strategy materials in an attractive and efficient manner. Because the developed interactive PowerPoint meets the criteria for correctness, breadth and depth of concepts, conformity to content standards, language and sentence clarity, usage, and an appealing appearance, it can be implemented as an interactive multimedia PowerPoint that provides high-quality learning. The value of the developed interactive multimedia products is that anybody freely could copy, own, and share them (11). Addition advantage of this product is that it could be operated on

a mobile phone equipped with a WPS program or a file player if there is no a computer (laptop). It is envisaged that the benefits of this interactive multimedia would make it much easier for athletes to acquire and grasp chess game strategy material presented by listening and observing simultaneously (12).

According to the findings of observations and interviews at PCGM, there seems to be no capable capacity of training media in the form of interactive multimedia which can assist the training process of PCGM athletes, and coaches demand athletes to memorize chess opening theory from an early age. As per the results of numerous interviews, athletes found it difficult to learn and retain chess opening theory, and they occasionally felt bored, lacked desire, lacked excitement, and lacked enthusiasm when practicing. Therefore, it is necessary to develop interactive multimedia products on chess opening containing chess opening theory and chess opening exercises (13). This interactive multimedia product was developed by considering the demands of athletes as well as the material's characteristics in accordance with the prevailing chess manuals. Attractive interactive multimedia products are expected to make athletes happier, more passionate, motivated, and more comfortable practicing independently (14). It is envisaged that this product could make it much easier for coaches to convey chess opening theory. As a result of this development study, researchers will develop interactive media PowerPoint of chess opening theory. This development research aims to develop a PowerPoint interactive multimedia product that offers chess opening theory and strategies.

2. Method

In this study, the research and development model was established to provide a medium for chess opening practice utilizing the research and development (R&D) methodology adapted from (15). The steps in the product design procedure are as follows: (1) Analysis of Needs, (2) Product Design, (3) Expert Evaluation, (4) Product Revision, (5) Small Group Trial, (6) Large Group Trial, (7) Final Product. The study design can be seen in Figure 1 below.

As material for requirements analysis, the initial data collecting procedure was carried out by observing and interviewing one coach and 15 PCGM early age athletes. Observations and interviews were conducted to discover more about the training process and how the demands of young athletes may help the training process. The activity was carried out with the help of PowerPoint software, 'Screencast O Matic' to record a laptop screen while explaining the opening of chess, which also uses a chess application, and

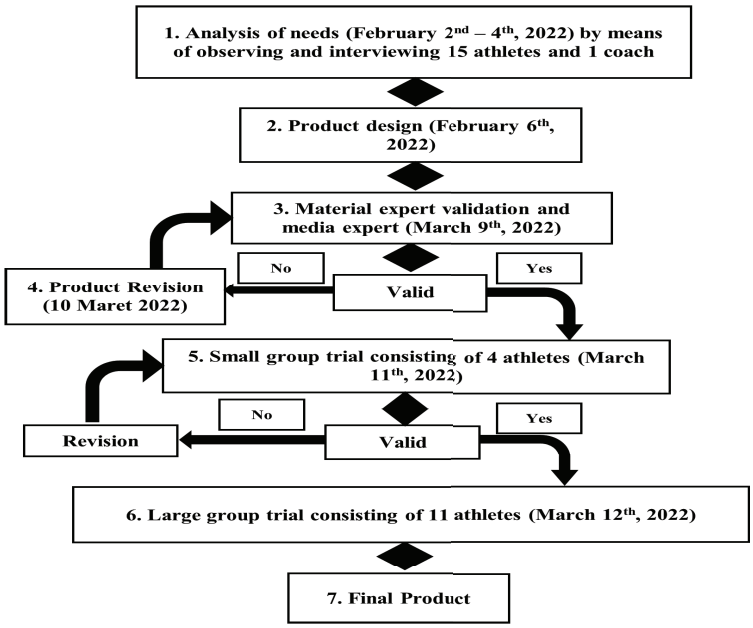

Figure 1: Research and Development Chart (15).

'PowerDirector 14 For Asus', which functions to combine previously created elements of text, animation, video, links, images, and graphics that have previously been designed in media script. After this product is completed, the next step would be validated by material experts and media experts. The following stage is product design, which includes creating material presentations, animations, sounds, graphics, and simulations.

In this research and development, the validation test implicated two experts who are specialists in their disciplines, one material expert and one media expert. The objective of expert validation is for empowered to criticism and suggestions for product shortcomings so that the product generated becomes more practically perfect and appealing. Then the subsequent stage is the product revision step.

The product revision stage is determined based on criticism and recommendations from media experts and material experts. This revision aims to make the products developed more perfect and appealing, and, of course, to make the product simpler and easier to use. After being revised and approved by the media and material experts, the product can then go to the small group trial phase.

The objective of testing the product in small groups is to determine its effectiveness, value, and the product uses in assisting and supporting the training process. A small group trial was conducted on four athletes in the range of age from 9 to 12 years old. After the athletes utilized the product, the researchers provided them a questionnaire with various questions regarding the substance, which the athletes at an early age had to answer.

At the product trial stage to a large group consisting of eleven athletes aged 9-12 years old, the researchers also provided them some questionnaires that had to be answered by the early age athletes in order to determine the uses and benefits of the product, so that the results of the questionnaires could be utilized as material for improvement to perfect the product. The type of data in this development research is descriptive qualitative data, and in collecting qualitative data observations and interviews at PCGM are carried out as a first step or identification of the requirement for the development of interactive multimedia PowerPoint. While quantitative data is utilized to present the questionnaire results in percentages, the questionnaire has been filled out by media experts, material experts, small group trials, and large group trials.

According to Akbar (2011), guide to getting data from validation and trial results (21):

V= $\frac{TSEV}{S-Max} = 100\%$

Description:

V : Validation

S-Max : The expected maximum score

100% : Constant

TSEV (Total Empirical Score Validator): Total score in research aspect by subject

In order to simplify things for researchers to draw conclusions based on the percentage of usability, effectiveness, and product attractiveness, the following product quality standards are established (16), as follows table 1 and table 2.

Table 1: Eligibility Level Criteria.

Category	Percentage	Qualification	Equivalent
A	81%-100%	Very Valid	Very Feasible
B	61%-80%	Valid	Worth
C	41%-60%	Quite Valid	Quite Decent
D	21%-40%	Less Valid	Less Worthy
E	<21%	Invalid	Not Worth it

Source: (Arikunto, 2010)

Table 2: Audience Assessment Criteria.

Answer Options	Score
Very Good	5
Good	4
Enough	3
Less	2
Very Less	1

Source: (Arikunto, 2010)

3. Results and Discussion

3.1. Results

Throughout the requirements analysis, observation and interviews were used to collect research data, while questionnaires were distributed during the expert validation test, small group test, and large group test. The research findings are presented in tabular form as follows:

1. **Phase of Needs Analysis**

The research and data gathering procedure begins with two stages: field observations and interviews. Field observations were conducted three times at the Gajahmada Malang Association (PCGM) on 14-16 February 2022 to examine the demands of the training process, in addition to observation, data was acquired through interviews with PCGM athletes and PCGM instructors. Several difficulties were discovered as a result of observations and interviews (Table 3).

1. **Stage of Product Design**

The following activity is indeed the design process of developing chess opening practice media in the form of PowerPoint. This is accomplished by creating flowcharts, storyboards, scripts, and the software preparation required to develop interactive multimedia PowerPoint presentations. Microsoft PowerPoint, PowerDirector 14 For Asus, and Screencast O Matic are the programs necessary. The outcomes of the development stage are interactive PowerPoint material that could be used to practice chess openings for early age athletes PCGM, in the developed product, provides an explanation of chess opening and practice, the theory developed follows the MCO book guide, and is linked to the lichess application for chess opening practice, as for the menu elements in the product, namely: (1) The front cover or title cover, (2) Product usage guidelines, (3) The beginning addresses the introduction of interactive media. (4) A mind map provides an information or thorough understanding to chess opening theory for athletes. (5) Apperception is emphasizing the importance of learning and memorizing chess opening theory. (6) chess opening material includes the ministerial gambit opening, the London system, Ruy Lopez, the Italian game, the Benko gambit, the Caro-Kann defensive, the French defense, the King Indian defense, and the Sicilian defense. (7) Chess opening exercises that have been addressed in the product, (8) Biographies of researcher and supervisor, (9) Additional media including website links, chess books, as well as chess book references. The following is a website link that the researcher established, if

Table 3: Results of Analysis Based on Observations and Interviews.

No	Observation and Interview Analysis	Analysis Results
1.	Material Analysis	Athletes find it difficult to memorize the theory of chess opening since there is too much material to memorize and thus no training media to assist it. The researcher decided to examine numerous kinds of chess openings that are commonly utilized by many chess players, including the *caro-kann defense, the London system, the Sicilian defense, the Quenss gambit, the French defense, the Benko gambit, Ruy Lopez, the King's Indian Defense, and the Italian game*.
2.	Material Analysis *(content)*	Innovative, interactive, and motivational training media are needed for athletes to boost their enthusiasm for training. Athletes require training models that include variety of media.
3.	Audience analysis	Innovative, interactive, and motivational training media are needed for athletes to boost their enthusiasm for training. Athletes require training models that include variety of media.
4.	Media analysis	Less development of training media, particularly chess opening material. Media or training materials are only available in the form of modules or obligatory handbooks for athletes in training process.
5.	Situation analysis	Athletes differ in terms of styles, interests, and learning capacities, which the coach cannot overcome throughout every meeting. Time limitations for learning chess opening material. The Covid-19 Pandemic which occurred and had an influence on the training process.

you want to utilize the product that the researcher developed, please click the link https://bit.ly/Website-Latihan-Opening-Catur.

1. **Presentation of Media Expert Validation Data**

The media development product for opening chess packaged in PowerPoint form which has been evaluated and assessed by media experts. Table 4 provides the result data from the validation tests conducted by media experts, as well as critiques or recommendations for enhancing the product.

The feasibility of PowerPoint interactive multimedia training medium was determined through validation. The data acquired from the media yielded 95% of the results. According to the media validator, the media is valid and can be tested. However, in order to maximize the process of testing the interactive multimedia PowerPoint developed, it is essential to review or revise, criticism or suggestions given by media experts is to add pictures or graphic information on the tactics defines slide so that it looks different to a lay person.

Table 4: Recapitulation of Media Expert Validation Calculation Results.

No	Grading Points	Score	Max Score	Percentage
1.	The accuracy of the background selection with the material	4	5	95 %
2.	The accuracy in which colour proportions were selected for such layout	4	5	
3.	the accuracy in which fonts are selected so that it makes easier to read	5	5	
4.	The accuracy in which the font size was selected so that it could be read easier	5	5	
5.	The accuracy in which the font colour was selected so that it could be read	5	5	
6.	Picture Composition	5	5	
7.	Picture Size	5	5	
8.	Clarity of audio back sound in conjunction with material delivery	4	5	
9.	The accuracy of the video selection in relation to the material's appropriateness	5	5	
10.	Interesting front cover media	5	5	
11.	The suitability of the cover with the media	5	5	
12.	Complete instructions for use	5	5	
	Total	**57**	**60**	**95%**

1. **Presentation of Material Expert Validation Data**

A material expert, as well a PCGM chess trainer who holds a National Master (MN) title and, of course, has mastered the theory of opening chess, has assessed and evaluated the product of developing chess opening practice media in the form of PowerPoint. Table 5 provides the data from material experts' validation test findings, along with criticism or recommendations for product improvement.

Table 5 is the outcome of a 90% material validation calculation, indicating that it is very valid and worthy of testing on PCGM early age athletes. The validation value reached with a percentage of 90% is consistent with the MCO book, and when evaluated from quantitative data on the validation of the feasibility of the material on average, it

Table 5: Recapitulation of Material Expert Validation Calculation Results.

No	Grading Points	Score	Max Score	Percentage
1.	The suitability of the material's presentation in relation to the athlete's development	5	5	90%
2.	Athletes' opportunity to practice on their own	5	5	
3.	Athletes' interactions with training media	5	5	
4.	Material reality	4	5	
5.	Material clarity	4	5	
6.	Material depth	4	5	
7.	The interesting way of presenting the material	4	5	
8.	The suitability of the sample presentation	5	5	
9.	EYD Language Compatibility	4	5	
10.	Language compatibility with target users	5	5	
	Total	**45**	**60**	**90%**

demonstrates that the level of feasibility of the content in interactive multimedia is very valid. According to the material validator, the medium is valid and can be tested. However, in order to maximize the PowerPoint interactive multimedia trial process developed, it is important to review or revise, criticism or recommendations provided by material experts to the chess opening practice media is a need to add a tactical puzzle to increase the ability of early age athletes to compete in the middle of a chess game (middle games).

1. **Presentation of Small Group Trial Data**

At this point, the PCGM has four (four) competitors aged 9 to 12 years old. The data from a small group trial are presented in Table 6.

The product trial was targeted 4 athletes from PCGM's early age. The data gathered from small group trials is 95% indicating that the product developed is in the very valid category and is feasible to use. They are also very happy, enthusiastic in learning, and extremely helped in understanding and memorizing chess opening theory, and of course athletes do not feel bored in learning and memorizing chess opening theory, so the products that have been tested in small groups generate a very positive responses, and then it tested on a large group consisting of 11 athletes.

Table 6: Recapitulation of Small Group Trial Results.

No	Grading Points	Score	Max Score	Percentage
1.	Is chess practice with an interactive multimedia PowerPoint including chess opening material interesting?	100	100	95%
2.	Is chess practice utilizing interactive multimedia PowerPoint with chess opening material easy to use?	85	100	
3.	Is the display on interactive multimedia PowerPoint with the opening material interesting?	95	100	
4.	Does the display on interactive multimedia PowerPoint with chess opening material help you understand the theory of chess opening?	90	100	
5.	Are the instructions on interactive multimedia PowerPoint with chess opening material easy to understand?	95	100	
6.	Is the content on interactive multimedia PowerPoint with chess opening material easy to learn?	100	100	
7.	Is chess opening material valuable in your life?	95	100	
8.	Is the chess opening exercise in interactive multimedia PowerPoint with chess opening material easy to grasp?	100	100	
9.	Can you discover a strategy to practice that you enjoy utilizing interactive multimedia PowerPoint with chess opening material?	95	100	
10.	Has utilizing interactive multimedia PowerPoint with chess opening material stimulated your interest in practicing?	95	100	
	Total	**950**	**1000**	**95 %**

2. **Presentation of Large Group Trial Data**

At this point, 11 persons between the ages of 9-12 years old were tested on PCGM early age athletes. The data from a large group trial are shown in Table 7.

The product trial was targeted eleven PCGM athletes at an early age. From the big group trial yielded 97.81%, indicating that the product developed fits into the extremely valid category and is feasible to use. The majority of athletes' general reaction to this product is that they are happier, more enthusiastic, and no longer bored when practicing.

Table 7: Recapitulation of Large Group Trial Results.

No	Grading Points	Score	Max Score	Percentage
1.	Is chess practice with an interactive multimedia PowerPoint including chess opening material interesting?	100	100	97,81%
2.	Is chess practice utilizing interactive multimedia PowerPoint with chess opening material easy to use?	100	100	
3.	Is the display on interactive multimedia PowerPoint with the opening material interesting?	94,54	100	
4.	Does the display on interactive multimedia PowerPoint with chess opening material help you understand the theory of chess opening?	100	100	
5.	Are the instructions on interactive multimedia PowerPoint with chess opening material easy to understand?	96,36	100	
6.	Is the content on interactive multimedia PowerPoint with chess opening material easy to learn?	96,36	100	
7.	Is chess opening material valuable in your life?	98,18	100	
8.	Is the chess opening exercise in interactive multimedia PowerPoint with chess opening material easy to grasp?	96,36	100	
9.	Can you discover a strategy to practice that you enjoy utilizing interactive multimedia PowerPoint with chess opening material?	98,18	100	
10.	Has utilizing interactive multimedia PowerPoint with chess opening material stimulated your interest in practicing?	98,18	100	
	Total	**978,18**	**1000**	**97,81%**

90% of the final data were gathered from Material Experts, 95% from Media Experts, 95% from small group trials, and 97.81% from big group trials. The graphs of the whole data analysis from the beginning to end by experts, small group trials, and big group trials are shown in Figure 2.

3.2. Discussion

The development of chess opening training media in the form of PowerPoint intends to boost the motivation and enthusiasm of PCGM early age athletes in attempting to learn and memorizing chess opening theory. This practice media contains numerous

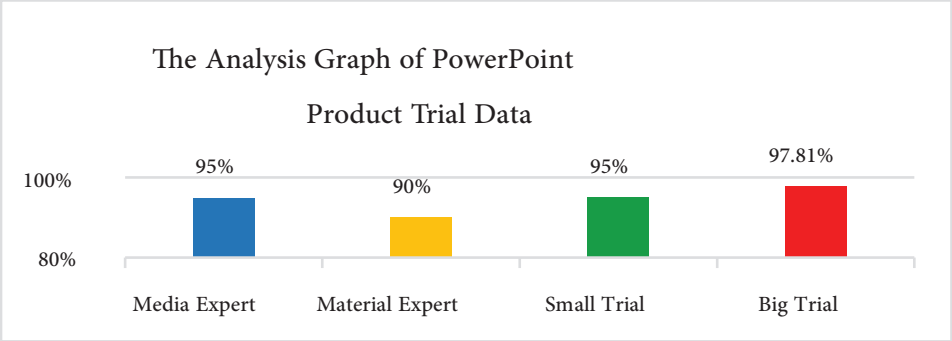

Figure 2: Graph of *PowerPoint* Product Trial Data Analysis.

chess opening theories which are of interest to PCGM early age athletes. Athletes also could start practicing opening chess by applying directly whatever they have managed to learn in this product. Several factors must be addressed while developing media, including the requirement for athletes and coaches, the media developed being as simple as possible so that athletes could use it, and the media developed becoming as appealing as possible so that it is less boring (17)**.** The developed media must be constructed as attractively as possible so that athletes do not become bored while learning and memorizing chess opening theory using this media, and the presentation of the training media should be designed relatively simple and easy for athletes to utilize. (7).

PCGM early age athletes between the ages of 9-12 already comprehend the fundamental idea of chess opening, which is mastered and demanded by each athlete, because of mostly the theory of opening chess is still presented in English language books, as well as limited explanations as a result, athletes find it extremely difficult to memorize too much opening theory of chess, regardless of the fact that learning the theory of opening chess is highly crucial for an athlete, because opening chess is the beginning of a chess game that can establish a chess game strategy. Opening pattern is the key to opening the game chess itself, which is the foundation of next game to be played by players who are going to compete that determines victory (23)

Expert-validated exercise media must be developed in a clear, appealing, and simple manner. This remark is intended to help the chess opening practice function well with this medium. The practice media utilized must be appropriate for athletes and coaches to be more effective and active in engaging in training, because it is intended that by implementing it, it is hoped that the athlete's training process would be maximized and exercises can become easier to carry out with the use of this media (19).

In a previous similar development study, the media developed solely discussed the basic techniques of playing chess, the history of the chess game, and the introduction

of chess pieces (20). If it is applied for early-age athletes, this is indeed not suitable and is not maximally helpfu l, since the media developed is more mainly targeted at lay person. It can be said that, because all of the existing features are not the core of the game of chess, and also the introduction of chess pieces and history Chess is far too easy to learn even if you don't have access to any material or resources. Therefore, the researcher comes up with an idea to create and developed the chess opening practice media which cannot solely be used by the early age athletes, but also everyone regardless of age. It is expected to assist anyone who intends to learn and grasp the theory of chess openings easily. After all, it is simply a matter of how a player aims to become a great player.

The evaluation step in the design stage is accomplished by assessing the design, both in terms of assembling product concepts, component lists, and the compilation of assessment instruments which have been made prior to the development phase of PowerPoint interactive training media products. The product development was tested on PCGM early age athletes as many as 15 athletes.

The findings of developing chess opening practice media products wrapped in PowerPoint form earned a 90% approval rating from material validators, 95% from media validators, 95% approval rating from small group trials, and a 97.81% approval rating from large group trials. These findings suggest that the development of interactive multimedia PowerPoint training media for chess opening exercises for early age athletes in Malang City is extremely valid and appropriate for usage by PCGM early age athletes.

4. Conclusion

Based on the results of research and development that have been conducted regarding the development of chess opening practice media as a means of efficiently and rapidly acknowledging chess opening theory, it can be concluded that: (1) the product is indeed very easy to use and very supportive as a chess opening practice medium, (2) the development of chess opening training media tends to make athletes more enthusiastic, joyful, and no longer bored in rote memorization and grasp chess opening theory.

The study of the development of chess opening exercise media resulted in the creation of a product in the form of a video packed in the form of PowerPoint and a website. Because this product is utilized with a cell phone or laptop, it can be used any place and at any time. This research and development has been assessed or validated by experts, small and large scale trials, and the practicality of a highly valid category, signalling that it can be utilized by early age athletes in Malang City.

This product is hoped that this product will contribute or become a reference in the training process. In a previous study, in 2015 using Adobe Flash media only discussed the introduction of chess pieces and rules in chess games, as well as terms in chess games (20). So, with this reference, the researcher has the idea and vision to develop a chess opening training medium for early age athletes, which not only discusses the introduction of chess pieces but rather to the core in the game of chess, considering previous development research was indeed good, but it is insufficient if applied to early age athletes of PCGM, so that the researchers developed a PowerPoint interactive media as a medium for early age PCGM athletes to practice opening chess.

Acknowledgements

In the acknowledgment section, the author can state the source of research funding and more specifically to the contract number. Make sure the statement complies with the guidelines provided by the funding agency. The author can also express his thanks to reviewers and proofreaders, or technicians who help prepare equipment set-ups or students who assist in surveys.

References

[1] Mageth B. Bagaimana memahami permainan catur permainan pembukaan. 1987.

[2] Anshory B. Pengaruh modul “Utak-Atik Catur” terhadap pemahaman taktik catur pada anggota unit kegiatan Mahasiswa Catur Universitas Negeri Yogyakarta. 2015.

[3] Moravčík, M., Schmid, M., Burch, N., Lisý, V., Morrill, D., Bard, N., & Bowling, M. (2017). Deepstack: Expert-level artificial intelligence in heads-up no-limit poker. *Science*, *356*(6337), 508-513.

[4] Azmi Z, Saripurna D, Anwar B. Aplikasi jaringan syaraf tiruan untuk pengenalan pola pembukaan permainan catur. Jurnal Ilm Saintikom. 2013;12:139–152.

[5] Coulom R. Efficient selectivity and backup operators in Monte-Carlo tree search. International Conference on Computers and Games. 2006;72–83.

[6] Syastra AS dan MT. Pemanfaatan Media Pembelajaran Berbasis Teknologi Informasi Bagi Siswa Kelas X Sma Ananda Batam. CBIS Jurnal. 2015;3:79.

[7] De Bruin ABH, Rikers RMJP, Schmidt HG. The influence of achievement motivation and chess-specific motivation on deliberate practice. Journal of Sport and Exercise Psychology. 2007;29:561–583.

[8] Bellemare MG, Naddaf Y, Veness J, Bowling M. The arcade learning environment: An evaluation platform for general agents. Journal of Artificial Intelligence. 2013;47:253–279.

[9] Ha D, Schmidhuber J. Recurrent world models facilitate policy evolution. International Conference on Neural Information Processing Systems. 2018;2455–2467.

[10] Silver D, Huang A, Maddison CJ, Guez A, Sifre L, van den Driessche G, et al. Mastering the game of go with deep neural networks and tree search. Nature. 2016;529:484–489.

[11] Damarsasi F. Pengembangan multimedia pembelajaran interaktif berbasis lectora pada pokok bahasan peninggalan sejaran Kelas IV semester I. 2014.

[12] Hamid S. Pengembangan multimedia interaktif keterampilan menulis di SMP. Progr Pascasarj UNY. 2010.

[13] Mahnun N. Media pembelajaran (Kajian terhadap Langkah-langkah Pemilihan Media dan Implementasinya dalam Pembelajaran). An-Nida. 2012;37:27–34.

[14] Gelada C, Kumar S, Buckman J, Nachum O, Bellemare MG. DeepMDP: Learning continuous latent space models for representation learning. Proceedings of 36th International Conference on Machine Learning. 2019;97:2170–2179.

[15] Sugiyono. Metode penelitian pendidikan (Pendekatan Kuantitatif, Kualitatif, dan R&D). ALFABETA, CV; 2016.

[16] Arikunto. Prosedur penelitian suatu pendekatan praktik. Jakarta: PT Rineka Cipta; 2010.

[17] Supriyono. Pentingnya media pembelajaran. Pendidik Dasar. 2018;2:43–48.

[18] Catur K. Penjaskesrek, STKIP PGRI Trenggalek, Jawa Timur, 66319 Indonesia. 6568881062021;656888106CE6568881066665547600Journal name required.18:37–46.

[19] Hermawan S. Profil guru penyandang tunanetra (is) berprestasi di cabang olahraga catur tingkat Asia tenggara. Jurnal Penelit Pendidik Kebutuhan Khusus. 2019;7:264–2671.

[20] Prajatama A, Rusli M, Deriani NW. Aplikasi multimedia pembelajaran interaktif strategi permainan catur. Jurnal Sist Dan Inform. 2015;9:24–35.

[21] Akbar SD, Sriwiyana H. Pengembangan kurikulum dan pembelajaran ilmu pengetahuan sosial. Yogyakarta: Cipta Media; 2011.

[22] Azmi Z, Saripurna D, Anwar B. Aplikasi jaringan syaraf tiruan untuk pengenalan pola Pembukaan permainan catur. Jurnal Saintikom. 2011;10.