

Card Game Element Rising Academy to Improving Decision Making Ability

Hady Pranoto¹, Ewaldo Genaldi², Richard Anthony³,
Andri Kurnia⁴, Harco Leslie Hendric Spits Warnars⁵,
Agung Trisetarso⁶

^{1, 2, 3, 4}Computer Science Department,
School of Computer Science.

^{1, 5, 6}Computer Science Department,
BINUS Graduate Program - Doctor of Computer Science

^{1, 2, 3, 4, 5, 6}Bina Nusantara University
Jakarta, Indonesia 11480

¹hady@binus.edu, ²ewaldo.genaldi@binus.ac.id,

³Richard.anthony001@binus.ac.id, ⁴andri.kurnia@binus.ac.id,

⁵spits.hendric@binus.ac.id, ⁶atrisetarso@binus.edu

Bahtiar Saleh Abbas
Industrial Engineering
Department
Faculty of Engineering,
Bina Nusantara University,
Jakarta, Indonesia 11480
Bahtiar@binus.edu

Wayan Suparta
Civil Engineering Department,
University of Technology
Yogyakarta, Indonesia 55285
drwaynesparta@gmail.com

Abstract— Mobile Game is very popular for many people and can be played anytime, anyplace. “Elements Rising Academy” developed to make user who play this game increased in decision making and problem solving ability. more. Game developed use Waterfall framework and modeled use Unified Modelling Language (UML). This research result this game very entertaint, interesting, and easy to play and game increasing the problem solving and decision making skill.

Keywords---Card Game, Strategy Game, Problem solving and decision making

I. INTRODUCTION

Play a Game is very popular activity among the people, from children to adults, they likes to play games to fill the leisure time, for entertainment themselves, and for some people play game as professional job, and the make income play game. From World Competitive Game Event, born many professional gamers.

Game technology grow fast, Game SIARENT, VRZ Torment, REDOUT use the latest technology, utilized augmented reality technology, visual reality, and haptic sensors. Game industry also growing up, it is showing from the number of companies in the game development, entertainment field that sponsor and facilitate events that take place around the world. For example, Blizzard Entertainment a game company, that held Blizzcon event in late 2016 to promote and hold big competition for their flagship games, such as Hearthstone and Overwatch.

The game is now widely used in Education field to improve the ability of students, both hard skill and soft skills. Hard skill is technical skill can be achieved from play that game. Soft skill, are skill not related to technical but gained when play the game, decision making and problem solving are some example of soft. Some research find fact the student learning more,

when they do it in a competitive situation in game activity compared to boring activity, Milczynski[1].

The kind of soft skill will gain when playing a game depending on game format. In strategic game, students can simultaneously build their problem solving skills to win the game, and also having fun throughout the process if an game instructional is well-designed[2], [3]. Some game increasing factual knowledge the student, in Almeida [4] research they found not only factual they get, but personalized education game approaches promoted learning but also motivation as the subjects of this study advanced learning acquisition.

Other research conducted by Seng et al [5] implementing game in studying object oriented programming, in this research computer game can be useful learning and teaching tools for object oriented programming, through gamification the learner can get knowledge they required, the computer game can guide the learner, step by step way to achieve the objective of the learning process base on the learner skill and their preferences.

In this modern age, more people are playing games on their personal gadgets, like smartphones or tablets than on consoles or personal computers (PCs) because it is more practical and flexible. Mobile device become popular, two popular operating system used in mobile device are android and IOS, because that's operating system is user friendly and easy to use. Author developed the game using Unity as development tools, and android operating system because the author has technical skill on that. Unity as development tools can build application on Android and IOS [6].

One type of game is a card game, Card game is a game that uses a set of cards as a tool and usually played by 2 or more people. Given the different types of card options and predefined game rules, players must think how to win games with the cards. The unique thing about card games compared to other types of games is that when playing card games requires more analysis and thinking power to optimize the different types of cards available to win the game.

To increase the soft skill decision making and problems solving, the author is created an Android-based game card application genre named "Elements Rising Academy" which requires precision and strategy in playing it. And will test: Can "Elements Rising Academy" card game application increases the decision making and problems solving skills of players?

II. RESEARCH METHODOLOGY

Author use waterfall framework to analysis, design and develop the game. The stage on Waterfall framework are [7], [8]:

- a. Communication
 - Project initiation: in this early stage, author determines the scope of application create.
 - Requirement Gathering: at this stage, author did literature review and observation, from many sources to get information about how the form of games to be made, what features are interesting to find in the game, interesting game story, and how game play will be built to make interested to the game players. Author also questionnaires to game user, to know the requirement and the user want, about the features that should be inside the game.
- b. Planning: At this stage author estimated project time required to make this. At this stage also performed scheduling tasks to finish the application in accordance with the estimated time.
- c. Modeling: designing systems of applications to be created using Unified Modeling Language (UML): Use-Case Diagrams, Class Diagrams, and Activity Diagrams as tools for design.
- d. Construction: at this stage author coded the project using Unity and testing it.
- e. Deployment: at this stage game implemented and evaluated to get evaluation form the user about usability and software quality.

"Elements Rising Academy" is a strategy card game, played on android mobile device, the concept this game about life in a magical fantasy world, and in this world life many mystical monsters that have elemental powers. Player at this game acts as a ghostly character who wants to learn magic at a wizarding school, to achieve the goal study in this wizarding school, have magical ability, every student in this school gets the task to defeat the monsters, in this magic world, the ghost character must defeat the evil beings during his journey to the school of witchcraft.

A. Gameplay

Gameplay this game only one, for each stage, is winning the stage with ability of decision skill to choose the card, to defeat the evil monster, if player can defeat the monster, player can continue to next stages.

Adventure/Story mode: player must follow the story to finish this game, some conversation between player and monster will found in this game.

The player can choices four type of Elemental Card: fire, water, wind, and earth. Player can use many element cards in one turn.

At each stage, game started with randomly choose who will start first, player or computer. The player and computer at the first-time must choose four cards on deck, card placed in hand. Each player has health point as their live in this game, during the game if player or computer reach zero point of health player or computer will defeated. In each turn, each player, gets one mana point, and must draw a card from on the deck, number of card in hand are teen card, player must earn mana point playing the spell card, the spell card can play depend on mana point each player, if player have teen mana point, player can play spell card with teen mana point or less. To use spell card or call the monster, did drag and drop the card which want to play from hand to field or enemy monster, or enemy character. The monster in game only done one attack for each turn, unless the monster had special attack (double attack), each attack will reduce the health point from character or monster, if the health point reached zero, monster or character will defeat. Player can finish they turn without attacked the opponent. That style of game, how gameplay design, and what featured interested for the player, the idea influenced by works done by Goes et al, Cowling et all, Brathwaite et all [9]–[11]

B. Game Component

This game component build from game component introduce by Adam [12]:

- a. Story: telling about a ghost who wants to learn magic in a magic school. But the ghost must defeat some evil creatures during his journey to magic school
- b. Character: player or computer have character; ghost, troll, sorcerers and head wizard school.
- c. Card:
 - Monster cards: this kind card that has an attack and health that is used to attack an opponent player.
 - Spell card: magic spell card that has a unique effect to help win the game.
 - Mana: resources used to call monsters or use spell.
 - Deck: Contains a collection of monster and spell cards, total 20 cards. Player choose the card from deck.
 - Hand: Place the card taken from the deck before use
 - Field: Place to put the monster to attack and activate the spell effect.
 - Health: player has zero health point will defeated.
 - Multiple class card type: player can use multiple class card type if have enough mana.

C. User Interface and Card Design

Author design some user interface and card design; the screen and card design can see below:



Fig. 1. Game component: (a) Game Fields



Fig. 2. Game Character: Ghost, Troll, Soccerer, Principal (left to right)

by Pressman [7] and Sommerville [8], based on author analysis, use case diagram for this game is:



Fig. 3. Card: Spell, Monster, and Element: wind, water, fire, earth (left to right)

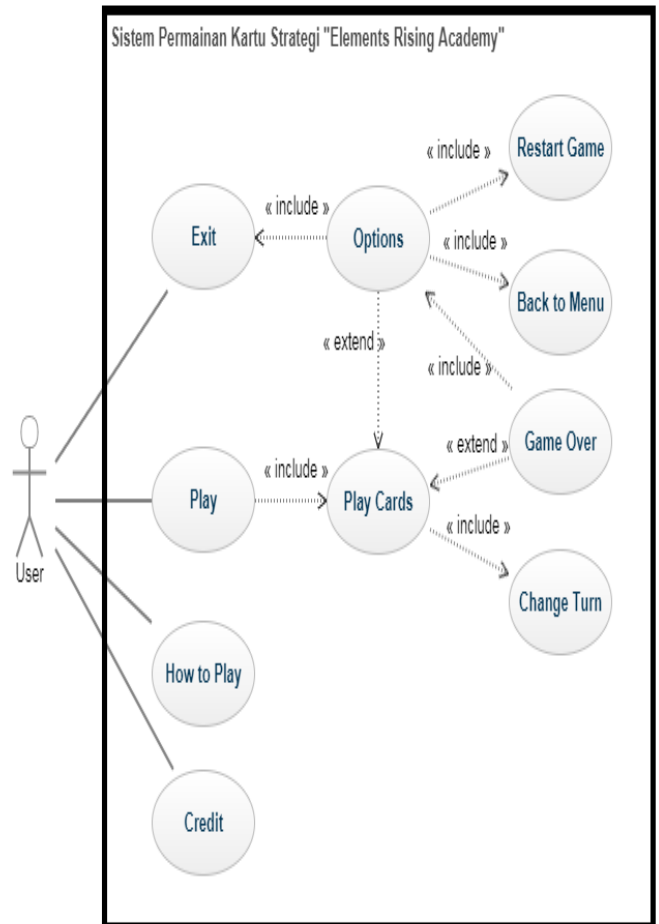


Fig. 4. Use Case Diagram for E.R.A

D. Modeling

When developing this game, author using UML notation for modeling, in this article author using UML standard introduce

Based on analysis, many activity diagrams can draw from use case. After many steps modeling like make use case description, draw sequence diagram, activity diagram, collaboration diagram, at the center of modeling, author make class diagram, can see in fig 5.

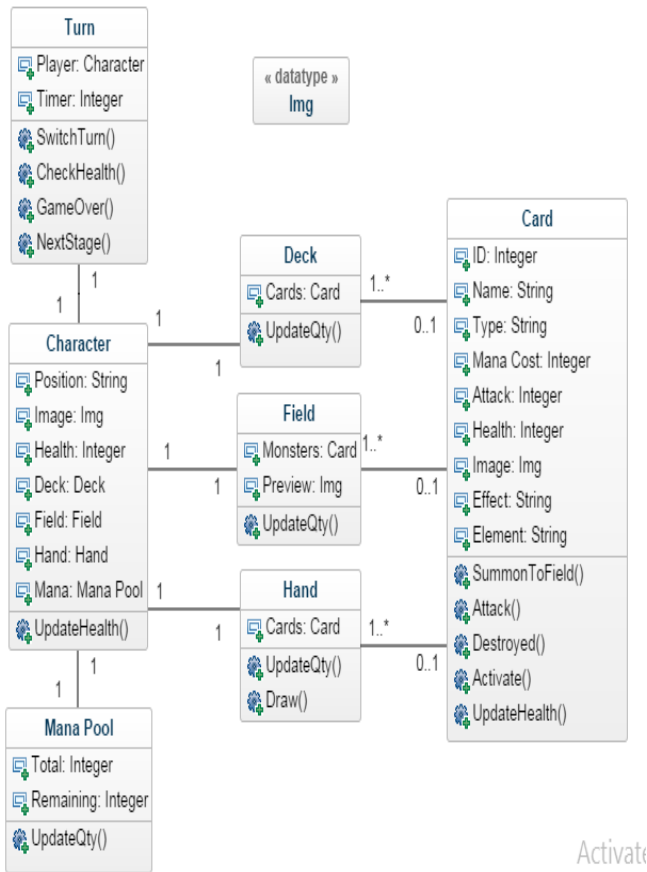


Fig. 5. Class Diagram for E.R.A

The next step after modeling is, do the construction on the game, or make the program (coding) and do the test. After the program can run well. Then the next step is to evaluate the game, ranging from aspects of usability, user interface, game quality, and the benefits of this game for players.

To evaluate the system. How the system impact on decision making and problem-solving skill, the author design some scale Likert question to ask the respondent get user perception if the system gave impact on that skill. In general form the question are:

- Game GI is make you interested to play the game?
- For you this game easy to play?
- You found difficulty or problem when playing this game?
- How about game level difficulty?
- You enjoy when play this game?
- After you play this game, do you think your decision making and problem solving are increase?

Forty respondents from variate age, gender and education asked using this question to get they user perception about this game, and the answer evaluate use basic statistic descriptive.

III. DISCUSSION

In research did by Almeida [4], about effect educational game for achievement of factual and simple conceptual knowledge acquisition, show the significant result grade A against, it show the how learning by playing game, gave positive effect to result learning process.

Tsai research [13], show a digital game as supplement and verify study tools, the game improved student learning results and increase challenge, curiosity, entertainment motivation, and less boredom.

In soft skill aspect, some research show game involvement gave positive link to expressivity and emotional control skill, this did by kowerd and Oldmeadow [14]. Research by Gonzales et al[15], video game gave effect to children communicate and express emotions. And also Bachen et all [16] research confirmed a simulation game are effective way promote interest for other culture and empathy.

Evaluation is done by measuring the user's perception of the game, how to ask 40 respondents to play the game. Then after playing the game the respondent is given a queryer question with the questions seen in table 1. The type of question has 5 scale Likert, from strongly disagree into strongly agree.

TABLE 1. QUESTION LIST

#	Question	Likert Scale				
		1	2	3	4	5
a	Game GUI is make you interested?	0	3	15	21	1
b	This game ease to play?	12	18	8	2	0
c	You not found trouble to play this game	0	4	8	27	1
d	Game difficulty (1: very easy, 5: very difficult)	11	9	15	5	0
e	This game enjoyable?	0	0	2	20	18
f	After play the game, you do you feel, your decision making and problem skill is increasing?	0	8	10	16	6

After the game evaluated by the user through the questionnaire technique, and the results of his evaluation obtained results:

- The user interface of this game, by the user is considered not interested (2) 7.5%, average (3) 37.5%, interesting (4) 52.5 % of respondents, very interested(4) 2.5%.
- For ease of playing this game aspect, respondent answer 30% very easy (1), 45% find it easy (2), average (3) 20%, difficult (4) 5%.
- In aspect difficulties in understanding card game information, 10% have some trouble (2), 20% normal (3) 67.5 % slightly problem (4), 2.5% never have trouble (5).
- Game level, 27.5% say it very easy (1), 22.5 % easy (2) , 37.5 % normal (3), 12.5 % , slightly difficult (4).
- Most users (95%) feel entertained by playing this game. They give a value of 4 to 5.
- For decision making and problems solving skill increase level, respondent say 20% not agree, 25% average, 40% increase, 15% very the game increase they skill.

Some question to measuring, the eights golden role asked to player, to measuring the quality of game. Eights golden role introduce by Schneiderman [17] as role guide to assessment the quality of application in human computer interaction quality aspect.

IV. CONCLUSION

Based on the results of evaluation, author can make conclusion about card game strategy "Elements Rising Academy" for the Android it as follows: the game is enjoyable and Entertaining the player. This game appeals to the player, gives the enthusiasm to play it continuously, easy to play, from the side of the gameplay is not confusing, the player can easily play the game without reading the manual, because the game provides feedback response when an error occurs. The user interface is structured to make it easier for players to play the game. And the latter is E.R.A game, improves decision-making and problem-solving abilities, accustomed to solving problems in a short time when playing the game.

V. FUTURE WORK

For the next work the features expected in the game are: online features and multiplayer battle, give more challenging for player, because the player must make strategy, make decision to win the battle, more realistic as real world because the opponent is real human, have real intelligent, and increasing adrenalin when players can meet each other and play each other in a competitive manner. The second suggestion are adding a 3D graphical display, such as in the display of monsters that have been placed in the field to make the game more interesting

REFERENCES

[1] K. a Milczynski, "Literature Review: Effectiveness of Gaming in the Classroom," pp. 1–14, 2011.

[2] B. MacKenty, "All Play and No Work," *Sch. Libr. J.*, no. 52, p. 46–48., 2006.

[3] C. Harris, "Meet the New School Board: Board Games Are Back--And They're Exactly What Your Curriculum Needs.," *Sch. Libr. J.*, vol. 55, no. 5, pp. 24–26, 2009.

[4] L. C. Almeida, "The Effect of an Educational Computer Game for the Achievement of Factual and Simple Conceptual Knowledge Acquisition," *Educ. Res. Int.*, vol. 2012, pp. 1–5, 2012.

[5] W. Y. Seng and M. H. M. Yatim, "Computer Game as Learning and Teaching Tool for Object Oriented Programming in Higher Education Institution," *Procedia - Soc. Behav. Sci.*, vol. 123, pp. 215–224, 2014.

[6] J. Hocking, *Unity In Action*. United States of America: Manning, 2015.

[7] R. S. Pressman, *Software Engineering: A Practioner's Approach*, Seventh. New York: McGraw-Hill, 2010.

[8] I. Sommerville, *Ninth Edition*. 2011.

[9] S. A. R. S. J. A. A. F. C. Z. T. Goes L. F., "HoningStone: Building Creative Combos With Honing Theory for a Digital Card Game.," *IEEE Trans. Comput. Intell. AI Games*, vol. 9, no. 2, pp. 204–209, 2017.

[10] D. S. P. E. J. W. D. & R. J. Cowling P. I., "Player Reference and Style in a Leading Mobile Card Game," *IEEE Trans. Comput. Intell. AI Games*, vol. 7, no. 3, p. 233–242., 2015.

[11] S. I. Brathwaite B., *Challenges for Game Designers*. United States of America: Charles River Media., 2009.

[12] E. Adams, *Fundamentals of Game Design*, Third. United States of America: New Riders, 2014.

[13] T. Chih-Hsiao and J. C. Yen, "Effect of an Equivalent Fractions Digital Game on the Learning Outcome, Motivation, and Flow Types among Elementary School Students," *Proc. - 5th Int. Conf. Educ. Innov. through Technol. EITT 2016*, pp. 70–75, 2017.

[14] R. Kowert and J. A. Oldmeadow, "(A)Social reputation: Exploring the relationship between online video game involvement and social competence," *Comput. Human Behav.*, vol. 29, no. 4, pp. 1872–1878, 2013.

[15] C. González-González, P. Toledo-Delgado, C. Collazos-Ordoñez, and J. L. González-Sánchez, "Design and analysis of collaborative interactions in social educational videogames," *Comput. Human Behav.*, vol. 31, no. 1, pp. 602–611, 2014.

[16] C. M. Bachen, P. F. Hernández-Ramos, and C. Raphael, "Simulating REAL LIVES," *Simul. Gaming*, vol. 43, no. 4, pp. 437–460, 2012.

[17] P. C. Schneiderman B., *Designing The User Interface: Strategies for Effective Human-Computer Interaction*, Fifth. United States of America: Pearson Higher Education, 2010.

[18] Warnars, H.L.H.S. 2008. Game Information System. Proceedings of CGAMES 2008 - 12th International Conference on Computer Games: AI, Animation, Mobile, Educational and Serious Games, Louisville, Kentucky, USA, 30 July-2 Agt 2008.

[19] Warnars, H.L.H.S. 2008. Virtual Information system on Working area. Indonesian Students' International Scientific Meeting, (Temu Ilmiah Internasional Mahasiswa Indonesia, TIIMI), pp. 169-181, London, United Kingdom, 5-7 December 2008.

[20] Warnars, H.L.H.S. 2010. Game Information System. International Journal of Computer Science and Information Technology (IJCSIT), 2(3). 135-148, June 2010.

[21] Suryapranata, L.K.P., Gaol, F.L., Soewito, B., Warnars, H.L.H.S. and Kusuma, G.P. 2017. Quality Measurement for serious Game. IEEE International Conference on Applied Computer and Communication Technologies (IEEE ComCom 2017), April 24-25, 2017, Jakarta, Indonesia.