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Extended abstract

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Recycle Now: Learning the 3R of Waste Management Through Game-Based Learning

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Abstract— **Reduce, reuse and recycle (3R) is the general principle of recycle that used in every country. This general principle helps to keep the environment tidy and clean. However, study is shows that people still lack awareness and knowledge about recycling. Thus, the purpose of this study is to design a 3D role-playing (RPG) for learning 3R, to develop a 3D in game-based learning. This project is use Rapid Application Development (RAD) approach as it is most suitable and provide a fully guideline to develop this game successfully. This game also uses Game-Based Learning Model which is Magic Circle Model. The project game also evaluated based on respondents from Usability Questionnaire that consists of two factor perceived usefulness and perceived ease of use. Findings of this game projects shows 78% of the overall total mean and shows that it has been reached it level of usability of educational computer games in game-based learning. In order to have a better playing experience for the future work, adding more challenging and mission for this game would be a good way to improve the quality of the game.**

Keywords—reduce, reuse, recycle(3R), recycling, RPG, game-based learning

I. INTRODUCTION

The solid waste in Malaysia has increased along with the tremendous population urbanization and the economic growth. According to [1], the close example that we can take is Malaysia which the solid waste has increasing more than 90% every ten years. This is because of the uncontrollable rate due to the use of the paper and plastic materials, particularly in packaging where these materials have supposedly recycled.

Moreover, people littering their rubbish on the ground which cause bad to the environment. This shows how they still lack knowledge about recycling. It is an important thing to deal with waste that requires a long time to decompose because, if left unmanaged, industrial waste can cause environmental harm by contaminating soil and water, killing decomposing animals with plastic particles, disrupting soil-penetrating rivers, reducing soil fertility and many more. Therefore, there needs to be a movement to reduce waste wasted.

The use of resources needs to decrease along with the consumption, and to do this as effective as possible, individual need to be aware of the consequences of their actions and should take responsibility to work against the environmental threat. Work should be done by recycling of unwanted materials by using 3R which are reduce, reuse, and recycle. The 3R concept is initiative aims to manage the solid trash produced by people activities while it also preserving the polluted environment [2]. Therefore, all of this need to be educate from young generation for a better future.

In order to educate young adult about recycling, role-playing game for recycling is created. Role-playing game is a game where the player gets to immerse into the character's role for a mission. According to [3], it requires strategic thinking, action, and specific content which player can assumes them as a role in a game based on the rule provided. Some advantages of role-playing games are that it can help the player thinking how to solve the mission carefully, helps to bring motivation the player to recycle in real-life environment. Other than that, using the game-based learning in this game can help the player learning recycling better. Game-based learning or GBL can describe as a learning which make it easier to learn with use of a game [4]. This will help the player learn from basic recycling which is the reduce, reuse and recycle (3R). According to [5], games are created with the goal of boosting the player's motivation and involvement. For example, when the players playing games, common attitudes such as being interested, goal to achieve, and seeking knowledge that are perfect way when it comes to learning. In conclusion, learning recycle through game-based learning helps the young adults to

know more better about recycling.

II. OBJECTIVES

To ensure that young adult learn how to recycle correctly, they have to learn it through 3D role-playing (RPG) to get the better explanation about recycle. It also could also help the young adult to improve their motivation to recycle the item and makeit the environment clean. Thus, there are three objectives to be fulfilled in this project.

i.   To design a storyboard 3D role-playing game (RPG) for learning 3R.

ii. To develop a 3D role-playing game (RPG) for learning 3R.

iii. To evaluate the usability of learning 3R in game-based learning.

For this project, game-based learning is applied. In Figure 1, shows the similar features with this project such as game goal, game design, game dimension and game platform. This existing game shows that learning while playing game could help the player to understand more about recycling.

Fig.1. Existing Project in Game-based learning

III. METHODOLOGY

The methodology used in this project is Rapid Application Development (RAD) model. The phases for this RAD model arerequirements planning, prototyping phase, construction phase and cutover phase.

The reason this model is chosen for this project is because it briefly planning the requirement and emphasize high priority on the prototype iterations. Thus, it is easy to constantly seek feedback from the end-user to enhance the quality of the product. RAD model use the iterative development methodology which feedback from user is important before the final product [6]. Moreover, RAD methodology gives faster development process than other methodologies. Each of RAD phases have their ownprocess and it is divided to make it more understandable to enable this project to success. Fig. 2 shows the phases of the RADmodel.
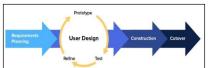

Fig.2. Phases of Rapid Application Development (RAD) model

IV. RESULTS AND FINDINGS

Feedback from the user is important to know the game effectiveness. For this project, to evaluate the usability of learning 3R using game-based learning is applied. Based on this evaluation, using the terms of "perceived usefulness" and "perceived easeof use". The items have thirteen items which is in a two group, six from "perceived usefulness" and seven from "perceived easeof use" [7].

The testing is taken from the 22 respondents consists of 9(40.9%) male and 13(59.1%) female participants. Furthermore, theresult shows the most participants are age between 21 years old to 23 years old with 15(68.2%). There are 2(9.1%) age of 18 years old to 20 years old. Lastly, age of 24 to 26 years old with 5(22.7%) that participate in this questionnaire. Most respondentswho are bachelor's degree students participate in this questionnaire with 13 (59.1%). The least are from STPM, Master's Degreeand Ph.D students with 1 (4.5%). Table 1 shows the participants in Recycle Now game.

Table 1. Participants in Recycle Now

Question	Range	Frequency(n)	Percentage (%)
Gender	Male	9	40.9%
	Female	13	59.1%
Age	18 to 20	2	9.1%
	21 to 23	15	68.2%
	24 to 26	5	22.7%
Education	SPM	2	9.1%
	STPM	1	4.5%
	Diploma	4	18.2%
	Bachelor's Degree	13	59.1%
	Master's Degree	1	4.5%
	Ph.D	1	4.5%

Table 2 shows the result of Recycle Now through Game-Based Learning details on the perceived usefulness. From the result of U1, majority of the respondents of 16(72.7%) are agreed that educational computer game provides the learning content in a vivid way. Recycle Now provide the clear images about recycle to the user mind. Next, 15(68.2%) respondents are agreed that the educational computer game is helpful in learning new knowledge. This is because Recycle Now provide the user learning about recycle while playing game. 17(77.3%) of the respondents that are agreed and strongly agreed about game-based learning approach smoothed the learning process, this is because Recycle Now gives the user information and easy to understand.

For the U4, 16(72.7%) shows that respondents agreed game-based learning approach is helpful with learning content. It shows with implemented game-based learning, the user can easily adapt with the content that they learn. Next, in U5 shows that 10(45.5%) respondents can learn better with game-based learning approach. Moreover, 6(27.3%) respondents strongly agreed with this because Recycle Now is a game-based learning with a lot of information provide in the game. For example, in the game describe about reuse, reduce, and recycle. In this result shows the standard deviation for (U5) is higher than the other with 0.756. This shows that game-based learning approach are suitable for this project.

Lastly in U6, the respondents are agreed and strongly agreed with 17(77.2%) shows that learning approach is more effective than other computer-assisted learning approach. The total mean value for perceived usefulness is 3.89.

Table 2. Perceived Usefulness Result

Items	SD	D	N	A	SA	Mean	Std. deviation
The educational computer game provides the learning content in a vivid way (U1)	0	0	6	15	1	3.77	0.529
The educational computer game is helpful to me in learning new knowledge (U2)	0	0	7	13	2	3.77	0.612
The game-based learning approach smoothed the learning process **(U3)**	0	0	5	15	2	3.86	0.56
The game-based learning approach is helpful to me in realizing the learning content **(U4)**	0	0	6	12	4	3.91	0.684
I feel that I can learn better with this game-based learning approach **(U5)**	0	0	6	10	6	4	0.756
A learning approach is more effective than other computer- assisted learning approaches I have experienced **(U6)**	0	0	5	12	5	4	0.69
Total Mean						3.89	

*SD – Strongly Disagree, D – Disagree, N – Neutral, A – Agree, SD – Strongly Agree

Table 3 shows the respondents' evaluation on the perceived ease of use. Based on (E1), the participants are agreed with 15(68.2%) that Recycle Now is not difficult. This game is a user friendly with rules that the user can read and follow. For the (E2), 14(63.6%) respondents are agreed that when learning, effort is less. However, 7(31.8%) shows neutral in this item. Next, 17(77.2%) are agreed and strongly agreed that Recycle Now is easy to understand the learning content. This is because there is information about recycle in the game such as the metal bin is for the metal item. Moreover, the standard deviation shows in (E3) is higher than other item as it proved that it is easy to understand the content of Recycle Now.

Educational computer games are easy to adapt because the content and user friendly provided in the game, and this are agreed from 17(77.3%) participants. 15(68.2%) agreed that it is not difficult to use the operating educational computer game. Next, in(E6) the participants are agreed and strongly agreed with 17(77.2%) that the interface is easy to work on. In Recycle Now, the interface used a basic color and easy to understand for example the main menu provides three option buttons. Lastly, this proved that educational computer game, Recycle Now is easy to use based on 15(68.1%) participants that are agreed with this statement.The total mean shows that 3.82 from perceived ease of use.

Table 3. Perceived Ease of Use Result

Items	SD	D	N	A	SA	Mean	Std. deviation
It is not difficult to use the educational computer game (E1)	0	0	7	13	2	3.77	0.612
I do not need to put in lots of effort during the learning activity (E2)	0	1	7	13	1	3.64	0.658
The learning content is easy to understand (E3)	0	0	5	12	5	4	0.69
I learned how to use the educational computer game quickly (E4)	0	0	5	15	2	3.86	0.56
Operating the educational computer game is not difficult for me (E5)	0	0	7	13	2	3.77	0.612
It is very easy to work with the interface of the educational computer game (E6)	0	0	5	14	3	3.91	0.61
The educational computer game is easy to use (E7)	0	0	7	12	3	3.82	0.664
Total Mean						3.82	

*SD – Strongly Disagree, D – Disagree, N – Neutral, A – Agree, SD – Strongly Agree

The overall mean of these two factors, perceived usefulness and perceived of use is 78%. This conclude that all the player isshow positive view about this game and this game project has reached it objective.

V. CONCLUSIONS

Applying game-based learning in a recycling topic can be a challenging task and difficult to grab people's attention and understand the true meaning about recycling. Most of awareness about recycling used in the campaign, which is a common wayto promote recycle. However, this method sometimes makes people lazy and unbothered to recycle because it does not apply theinteresting way on promoting the recycling. As this project, creating awareness by using educational game are engaging and effective way. Game-based learning on 3R waste management is a new way for the young adult to learn and understand aboutrecycling.

From the evaluation of the questionnaire, it is proved that it is interesting, engaging, and attractive to promote recycling for young adults. Game-based learning gives beneficial to the user and increase the motivation for the user in learning recycling. Although this project gives all the benefit, there are still have their owns limitations to become a perfect game. Therefore, the improvement can be made to counter back the limitation in the future.

REFERENCES

[1]   Y. C. Moh and L. Abd Manaf, "Solid waste management transformation and future challenges of source separation and recycling practice in Malaysia," *Resource Conservation Recycling*, vol. 116, no. 2017, pp. 1–14, 2017, doi: 10.1016/j.resconrec.2016.09.012.

[2]   M. M. Nadzir and N. F. A. S. Seowfuddin, "Reduce, Reuse, Recycle (3Rs) Awareness App: Mobile Learning Application for Supporting Environmental Awareness Initiatives," *2019 IEEE Conference e-Learning, e-Management e-Services, IC3e 2019*, pp. 31–34, 2019, doi: 10.1109/IC3e47558.2019.8971782.

[3]   R. Batista and C. V. De Carvalho, "Work in progress - Learning through Role Play Games," *Proceedings - Frontiers Education Conference FIE*, pp. 22–23, 2008, doi: 10.1109/FIE.2008.4720599.

[4]   J. L. Plass, B. D. Homer, and C. K. Kinzer, "Foundations of Game-Based Learning," *Education Psychology*, vol. 50, no. 4, pp. 258–283, 2015, doi: 10.1080/00461520.2015.1122533.

[5]   G. S. Karlsson, "Designing a Game for Learning About Recycling Designing a Game for Learning About Recycling" 2017.

[6]   F. Q. Khan, S. Rasheed, M. Alsheshtawi, T. M. Ahmed, and S. Jan, "A comparative analysis of RAD and agile technique for management of computing graduation projects," *Computer Materials Continua.*, vol. 64, no. 2, pp. 777–796, 2020, doi: 10.32604/CMC.2020.010959.

[7]   G. J. Hwang, H. Y. Sung, C. M. Hung, I. Huang, and C. C. Tsai, "Development of a personalized educational computer game based on students' learning styles," *Education Technology Research Development*, vol. 60, no. 4, pp. 623–638, 2012, doi: 10.1007/s11423-012-9241-x.