JME Volume 7 No. 2 Desember 2021
Hlm. 12-17 ISSN 2580-3522

Numerical Solution of SEIRS Model of Online Game Addiction on Mathmatics Students using Homotopy Perturbation Method

Nur Rezky Ramadhan[1*], Burhan[2]

[1]Department of Mathematics Education, Bosowa University
[2]Department of Primary Teacher Education, Bosowa University

author correspondence
*nur.rezkyramadhan@universitasbosowa.ac.id

ABSTRACT

This study aims to determine the numerical solution of the Homotopy Perturbation method as a solution to a numerical model of SEIRS addiction to online games where the data in this study is secondary data from a closed questionnaire in the form of answer choices given to students. This study has a Suspected-Exposed-Infected-Recovered-Suspected (SEIRS) model. Before determining a numerical solution using the RK-4 method, research was first conducted on the SEIRS model of online game addiction, then performed a simulation, then predicted the number of students' addiction to online games. The simulation results using the MAPLE application and this research can be used as a benchmark for parents and students regarding restrictions on the use of online games.

Keywords: *Homotopy Perturbation Method, Online Game, SEIRS*.

INTRODUCTION

Online games are played globally by two or more people via the internet or other computer networks simultaneously (Puspitosari, 2009). This type of game continues to increase due to the significant growth of computer networks (Syahran, 2015). Online games are now more and more and continue to grow, just like Facebook and Instagram which tend to have positive and negative impacts on teenagers, especially students. The negative effect can be in the form of addiction, which prevents students from achieving their various goals (Suplig, 2017; Malik, AR. 2019). And when players can't control themselves, learning and working to achieve their goals will be hampered. So that the game can be harmful to the mental and health of players (Ramadhani, 2013). Indonesia has 6 million online game fans with 40% teenagers. The survey shows that from 64.45% and 47.85% boys and girls aged 12-22 years are addicted and will continue to grow (Febrinca, 2014). Students and students participate strictly in online games, and can even lead to death. For example, people die from sitting in front of their computers for a long time (Syahran, 2015).

Some students at Makassar State University also have the same tendency, namely playing games, they can even spend hours playing online games (Ramadhan, 2021). Previous researchers have conducted a survey to Makassar State University students who will be addicted to online games, then carried out modeling in the form of Suspected-Exposed-Infected-Recovered-Suspected (SEIRS) then using the Homotopy Perturbation numerical method predictions will

be made for an increase in the number of students who are addicted for several years. forward.

METHOD

This study will show the results of the SEIRS modeling conducted by Side, 2021. Then the results of the modeling will be examined for accuracy using a numerical method, namely the Homotopy Perturbation method. (Ramadan, 2019)

RESULT AND DISCUSSION

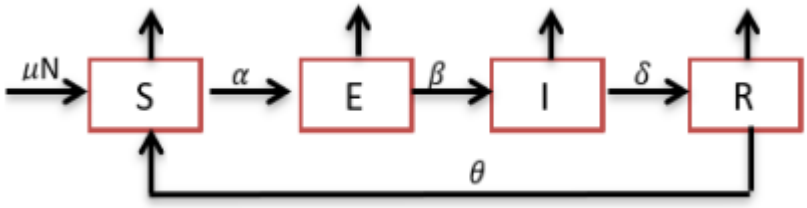

Figure 1. SEIRS Model schame for online game addiction

(Source: Syafruddin Side *et al* 2021 *J. Phys.: Conf. Ser.* **2123** 012005)

The entire population is classified into 4 populations, namely Suscept (S) as the number of students who do not play online games or students who have played online games but no longer play online games, Exposed (E) are students who play online games but not continuously playing, or not yet addicted to playing online games, Invected (I) is a student who has been addicted to playing online games, Recovered (R) is a student who has stopped or no longer plays online games. The SEIRS mathematical model of online game addiction can be seen in equation (1)-(4), the definitions and parameter values of this study are shown in Table 1 and Table 2.

$$\frac{dS}{dt} = \mu + \theta r - \alpha s - \mu s \quad (1)$$

$$\frac{dE}{dt} = \alpha s - \beta e - \mu e \quad (2)$$

$$\frac{dI}{dt} = \beta e - \delta i - \mu i \quad (3)$$

$$\frac{dR}{dt} = \delta i - \theta r - \mu r \quad (4)$$

Table 1. Parameters definition of the SEIRS model for online game addiction

Parameter	*Description*
μ	the rate of students leaving (moving, quitting, dropping out).
θ	the scale of movement from a group of students who are free from online game addiction (recovered) to a group who are prone to online game addiction (suspected).
α	the scale of movement from groups of students who are prone to online game addiction (suspected) to groups who start playing online games

	(exposed).
β	the scale of movement from a group of students who started playing online games (exposed) to a group who were addicted to online games (infected).
δ	the scale of movement from a group of students who are addicted to online games (infected) to a group who are free from online game addiction (recovered).

Table 2. Initial values of SEIRS model for online game addiction

Parameters	Values	Variable	Initial Value	Sample Propotion
μ	0,181	S	49	0,17
θ	0,331	E	220	0,78
α	0,036	I	2	0,007
β	0,895	R	13	0,04
δ	0,351	Total	284	1

Based on the SEIRS mathematical model in equations (1) – (4) and parameter data from Table 2, a numerical solution is obtained using the homotopy perturbation method of online game addiction in Table 3

Table 3. Numerical Solution of Online Game Addiction with Homotopy Perturbation Method

t	Suspected	Exposed	Infected	Recovered
0	49	220	2	13
1	48.87	218.49	3.36	13.07
2	48.74	217.01	4.64	13.21
3	48.61	215.55	5.83	13.41
4	48.49	214.10	6.96	13.65
5	48.36	212.68	8.01	13.95
6	48.24	211.27	9.01	14.28
7	48.11	209.89	9.94	14.66
8	47.99	208.52	10.82	15.07
9	47.87	207.18	11.65	15.51
10	47.75	205.85	12.44	15.98
11	47.63	204.53	13.18	16.48
12	47.51	203.24	13.88	17.00
13	47.39	201.96	14.54	17.55
14	47.27	200.70	15.16	18.11
15	47.15	199.45	15.75	18.69
16	47.04	198.23	16.30	19.28
17	46.92	197.01	16.83	19.89
18	46.81	195.81	17.32	20.52
19	46.70	194.63	17.79	21.16

20	46.59	193.46	18.22	21.82
21	46.48	192.31	18.62	22.49
22	46.37	191.17	18.99	23.18
23	46.26	190.04	19.32	23.90
24	46.15	188.93	19.60	24.66
25	46.05	187.83	19.81	25.46
26	45.95	186.75	19.96	26.32
27	45.85	185.68	20.01	27.26
28	45.75	184.62	19.93	28.32
29	45.65	183.57	19.68	29.53
30	45.55	182.54	19.22	30.94

From these data, the model simulation graphs are obtained in Figure 2 and Figure 3.

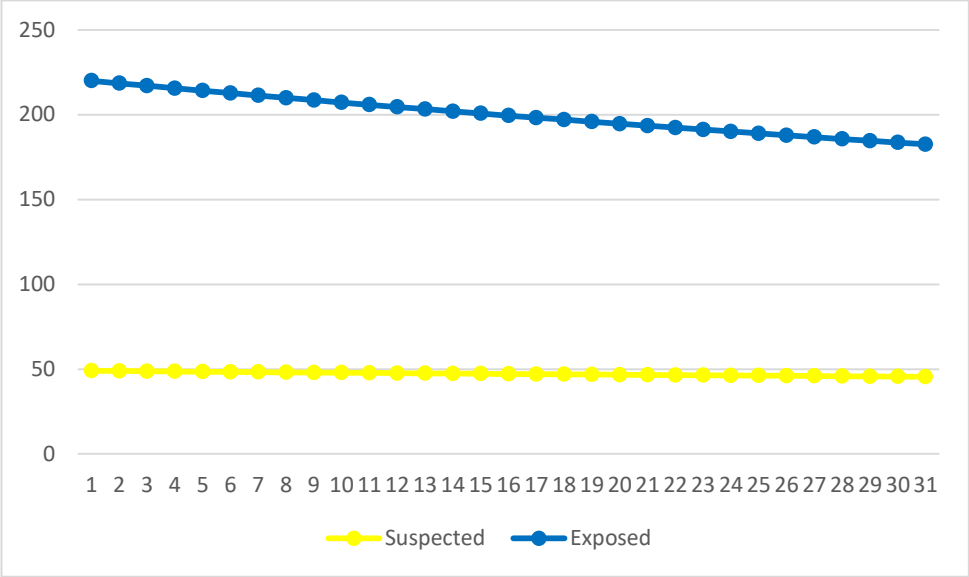

Figure 2. Graph of the Number of Suspected and Exposed Students

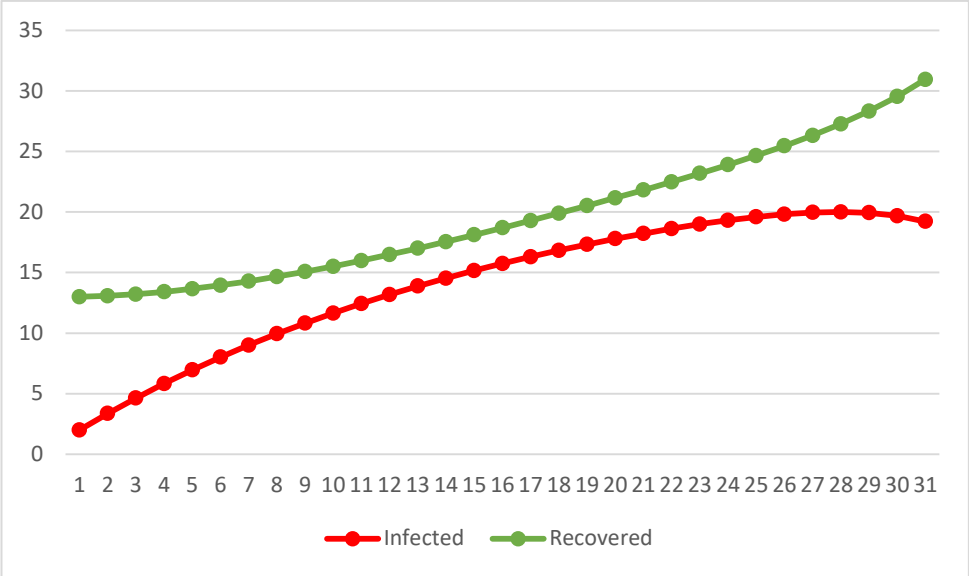

Figure 3. Graph of the Number of Infected and Recovered Students

Based on Table 3, the number of suscepted will be relatively decreased due to the movement of the number of students who are not addicted to online games to become interested or show interest in online games (Exposed), this is shown in the graph where the number of students who were exposed was initially 13 students to 32 students, but over time Over time, the number of students who are interested in online games will become addicted to online games (Infected), and will continue to increase from 2 students to 20 students, then the number of students who are addicted will decrease again due to the large number of students who are no longer addicted to online games and changed status back to being a vulnerable student to return to playing games.

Conclusion

Students who are vulnerable to playing online games will eventually become addicted to playing online games, this is shown in the graph whose initial value is 2 people to 20 people in a span of 26 days, this is of course influenced by the number of students who show interest in playing online games . But over time, students who are addicted to playing online games will realize the bad influence of playing online games, so that students will stop playing online games, or no longer addicted to online games. However, the student cannot be said to have completely stopped playing online games because at any time the student can return to playing online games.

DAFTAR PUSTAKA

Anwar, A., Syam, R., Pratama, M. I., & Side, S. (2021, June). SEIRS model analysis for online game addiction problem of mathematics students. In Journal of Physics: Conference Series (Vol. 1918, No. 4, p. 042024). IOP Publishing.

Henry, S. (2005). Panduan Praktis Membuat Game 3D. Yogyakarta: Graha ilmu.

Malik, A. R., & Asnur, M. N. A. (2019). Using Social Media as A Learning Media of Foreign Language Students In Higher Education. *Bahtera: Jurnal Pendidikan Bahasa Dan Sastra*, *18*(2), 166-75.

Puspitosari, W. A., & Ananta, L. (2009). Hubungan antara kecanduan online game dengan depresi. Mutiara Medika: Jurnal Kedokteran dan Kesehatan, 9(1), 50-56.

Ramadhani, A. (2013). Hubungan motif bermain game online dengan perilaku agresivitas remaja awal (studi kasus di warnet zerowings, kandela dan mutant di Samarinda). Ejournal Ilmu Komunikasi, 1(1), 136-158.

Ramadhan, N. R., Side, S., Sidjara, S., Irwan, & Sanusi, W. (2019, December). Numerical solution of SIRS model for transmission of dengue fever using Homotopy Perturbation Method in Makassar. In AIP Conference Proceedings (Vol. 2192, No. 1, p. 060015). AIP Publishing LLC.

Ramadhan, N. R. (2017). SolusiNumerikpada Model Penularan TBC denganMetodePerturbasiHomotopi (MPH) (Doctoral dissertation, UNIVERSITAS NEGERI MAKASSAR).

Syahran, R. (2015). Ketergantungan online game dan penanganannya. Jurnal Psikologi Pendidikan & Konseling, 1(1).

Suplig, M. A. (2017). Pengaruh kecanduan game online siswa SMA kelas X terhadap kecerdasan sosial sekolah kristen swasta di Makassar. Jurnal jaffray, 15(2), 177-200.

Side, S., Saman, A., Ramadhan, N. R., & Sidjara, S. (2021, November). The Accuracy of the RK-4 and RK-5 Technique as a Numerical Solution to the SEIRS Model of Online Game Addiction on Mathematics Students. In Journal of Physics: Conference Series (Vol. 2123, No. 1, p. 012005). IOP Publishing.

Side, S., Saman, A., Pratama, M. I., Ramadhan, N. R., & Sanusi, W. (2021, November). Numerical Solution of the SEIR Model for Online Game Addiction Problem by Homotopy Perturbation Methods in Students of Junior High School. In *Journal of Physics: Conference Series* (Vol. 2123, No. 1, p. 012004). IOP Publishing.