E-ISSN: 2798-0472 **DOI:** 10.52562/biochephy.v4i2.1412

BIOCHEPHY: Journal of Science Education

http://journal.moripublishing.com/index.php/biochephy

THE EFFECTIVENESS OF THE RADEC LEARNING MODEL ASSISTED BY INTERACTIVE GAMES ON MASTERY OF BASIC SCIENCE CONCEPTS IN ELEMENTARY SCHOOLS

Nurkhaerat Alimuddin[1]*, Ni Made Yeni Suranti[1], Riski Seprida[2]
[1]Universitas Mataram, Indonesia
[2]Universitas Pejuang Republik Indonesia, Indonesia
*Corresponding author: nurkhaeratalimuddin@staff.unram.ac.id

Abstract: This research aims to measure the effectiveness of the RADEC (Read, Answer, Discuss, Explain, and Create) learning model assisted by interactive games on the mastery of basic science concepts among prospective elementary school teacher students. This research uses quantitative methods with a non-equivalent control group-type experimental design. The research sample was student prospective elementary school teachers at Mataram University who were selected using a purposive sampling technique. Data collection techniques are carried out through objective tests in the form of and post-tests. The research results showed a significant improvement in the experimental group with an average pre-test score of 62.5 increasing to 84.17 in the post-tests. Meanwhile in the control group, the average pre-test score of 63.17 only increased to 68.5. This data proves that the RADEC model assisted by interactive games is more effective in improving mastery of basic science concepts compared to conventional learning methods. The RADEC model has also been proven to increase student engagement, motivation, and critical and creative thinking abilities in line with the demands of 21st-century skills.

Keywords: Effectiveness, RADEC Learning Model, Interactive Games

***Abstrak**: Penelitian ini bertujuan untuk mengukur efektivitas model pembelajaran RADEC (Read, Answer, Discuss, Explain, dan Create) berbantuan permainan interaktif terhadap penguasaan konsep dasar IPA pada mahasiswa calon guru SD. Penelitian ini menggunakan metode kuantitatif dengan desain eksperimen tipe non-equivalent control group. Sampel penelitian adalah mahasiswa calon guru SD di Universitas Mataram yang dipilih dengan menggunakan teknik purposive sampling. Teknik pengumpulan data dilakukan melalui tes objektif berupa tes awal dan tes akhir. Hasil penelitian menunjukkan adanya peningkatan yang signifikan pada kelompok eksperimen dengan rata-rata skor pre-test 62,5 meningkat menjadi 84,17 pada tes akhir. Sementara itu pada kelompok kontrol, rata-rata skor pre-test 63,17 hanya meningkat menjadi 68,5. Data ini membuktikan bahwa model RADEC berbantuan permainan interaktif lebih efektif dalam meningkatkan penguasaan konsep dasar IPA dibandingkan dengan metode pembelajaran konvensional. Model RADEC juga terbukti dapat meningkatkan keterlibatan, motivasi, serta kemampuan berpikir kritis dan kreatif mahasiswa sesuai dengan tuntutan keterampilan abad 21.*

***Kata Kunci**: Efektivitas, Model Pembelajaran RADEC, Permainan Interaktif*

INTRODUCTION

The Merdeka Curriculum was born from the thoughts of Ki Hadjar Dewantara who emphasized the importance of liberating humans physically and mentally through education. This curriculum aims to create fun and student-centered learning, with teachers as creative and effective facilitators. In the era of globalization, developments in science and technology require students to have 21st-century skills, namely critical thinking, communication, collaboration, and creativity (4C).

Science education is an important key in building students' interest and involvement in the natural phenomena around them, although in practice it is often trapped in monotonous and rote-based learning methods (Guiao, 2023).

The science learning context emphasizes one very important foundation, namely mastery of basic science concepts in understanding more complex natural phenomena, especially at higher education levels. The RADEC learning model (Read, Answer, Discuss, Explain, and Create) is a relevant solution in adapting to change. One of the principles of the Independent Curriculum is to provide space to create meaningful learning products through active reading and discussion. And to support the effectiveness of RADEC, additional strategies are needed in the form of the use of interactive games that can increase student involvement. Several research results show that science teachers in elementary schools are not oriented toward collaboration skills and increasing students' critical thinking abilities (Satria et al, 2019; Yulianti et al, 2022; Nuraningsih et al, 2023). Interactive games are also able to provide a pleasant learning atmosphere and increase curiosity so that motivation arises in understanding learning (Rahma et al, 2021; Aini et al, 2023; Supriyono, 2018).

The RADEC learning model is an alternative solution in improving higher order thinking skills (Higher Order Thinking Skills), scientific literacy, and provides a positive and acceptable influence for students to develop capacity compared to the lecture method. (Satriana et al, 2023; Sari & Sukmawati, 2023; Putri & Zulfadewina; 2023). The RADEC learning model involves in-depth conceptual modeling and encourages students to carry out various activities in the learning process. The use of interactive games in the RADEC learning model helps students increase student interest and motivation and can provide a more differentiated learning experience so that students with different skills and learning speeds can contribute and collaborate between students. Collaboration can build work skills and social learning (Fauzani et al, 2021; Sukmawati, 2021; Laine & Linberg, 2020, Zhan et al, 2022).

Observations of prospective elementary school teachers at Mataram University show that mastery of basic science concepts is still low and students are not yet fully active and responsive in the face-to-face learning process in basic elementary science concepts courses. As an alternative solution, it is proposed to apply the RADEC learning model combined with the use of interactive games as a learning support medium. The RADEC model provides activity-based learning in accordance with the principles of the Independent Curriculum, while interactive games are a tool to increase student motivation and understanding of concepts. Previous research shows that the RADEC model is effective in increasing scientific literacy and higher-order thinking abilities (Nurmaningsih et al., 2023; Tulljanah & Amini, 2019). Interactive games have also been proven to increase students' digital literacy, motivation and engagement in learning (Eliza & Karmila, 2021; Rosidah et al., 2022).

RESEARCH METHODS

This research is a quantitative research with a Quasy Experimental model using a non-equivalent control group design type of experiment. The population in this study were prospective elementary school teachers at Mataram University and the sampling technique used was purposive sampling technique. The data collection technique in research is using a test technique which is used to measure mastery of basic science concepts in the form of objective tests. The test was given to the control and experimental classes 2 times, namely pre-test and post-test. Data analysis techniques include descriptive tests to determine the effectiveness of the RADEC learning model assisted by interactive games on the mastery of basic science concepts by prospective elementary school teachers at Mataram University.

RESULTS AND DISCUSSION

Based on the results of research data processing in the experimental and control groups, the frequency distribution of scores for mastery of basic science concepts is presented in Table 1.

Table 1. Distribution of mastery of basic science concepts pretest and post-tests

Score	Category	Experimental class				Control class			
		Pretest		Postest		Pretest		Postest	
		F	P (%)	F	P(%)	F	P(%)	F	P(%)
≥75	Complete	10	33.33	27	90	12	40	19	63.33
< 75	Not finished	20	66.67	3	10	18	60	11	36.67

Based on the table and graph above, it can be seen that there was a significant increase in the frequency of mastery in both the experimental class and the control class. However, mastery of basic elementary science concepts in the experimental class was higher than in the control class, namely 90% in the experimental class and 63.33%. The data was then processed using SPSS 25 for descriptive analysis, with results displayed on Table 2.

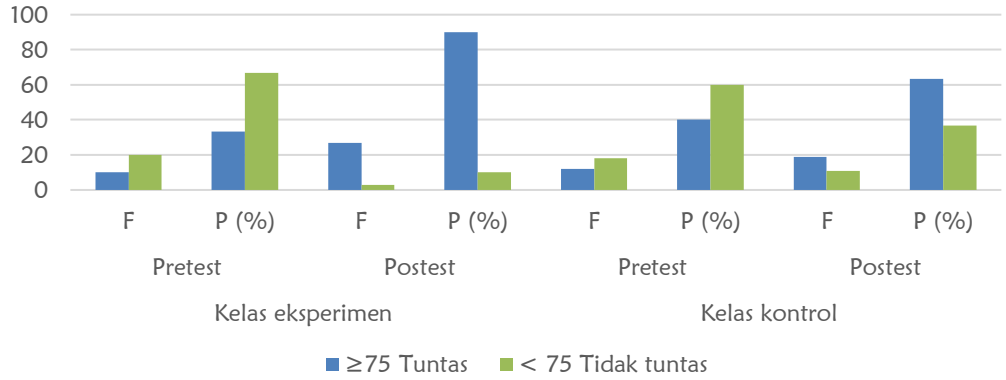

Figure 1. Pretest and post-test graphs for experimental and control classes

Table 2. Descriptive statistical analysis

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
PreTest Eksperimen	30	30.00	80.00	62.5000	12.57735
PostTes Eksperimen	30	75.00	95.00	84.1667	6.70606
PreTest Kontrol	30	35.00	75.00	63.1667	11.17905
Post-tests Kontrol	30	40.00	85.00	68.5000	11.68185
Valid N (listwise)	30				

Based on Table 2, it can be seen that there was an increase in the average score from 62.5 (pretest) to 84.17 (post-tests), which shows that there was a positive influence from the treatment given to the experimental group. A decrease in the standard deviation indicates that the scores have become more uniform, meaning that the effect of the intervention is fairly consistent across students. In the control group, there was a smaller increase compared to the experimental group. Namely the average from 63.17 on the pretest to 68.5 on the post-tests. The relatively similar standard deviation indicates that the variation in values remains stable before and after treatment.

This research used two class groups, namely the experimental class and the control class. Data is taken from test results in the form of multiple choice questions. Before providing basic science concept material, each experimental class and control class were given pretest questions which aimed to determine students' initial abilities. The pretest questions are in the form of multiple choice questions totaling 15 numbers which have gone through the previous validation stage.

After the pretest results were obtained from both experimental and control classes, then the two classes were given different treatments. The RADEC learning model treatment assisted by interactive games was given to the experimental class group, while the control class group was given collaborative learning model treatment. Pretest questions were given after giving treatment

to both experimental and control class groups. The pretest and post-tests results were then analyzed using the SPSS 25 application.

The results of the descriptive analysis showed that both class groups showed improvement, but the post-tests results in the experimental class were higher than the control class. The increase in post-tests results in the experimental class shows that the RADEC learning model is an alternative solution in presenting a learning model that can have a positive influence and can be accepted by students compared to conventional learning models such as lectures (Satriana et al, 2023; Sari et al, 2023; Putri et al, 2023; Fuziani et al, 2021).

Some of the advantages of the RADEC learning model in the learning process are the syntax aspect which increases learning activities (Handayani et al, 2019; Pratiwi et al, 2018). One of the syntaxes of the RADEC learning model is Read. At this stage students read learning material that is relevant to the topic to be studied, this stage supports reading skills and improves student understanding. Positive habits by carrying out reading activities before starting the learning process can increase students' reading interest (Pohan, et al, 2020). The RADEC learning model improves students' creative and critical thinking skills, the Read, Answer, Discus, Explain and Create stages encourage students to be actively involved in each syntax and help students acquire 21st-century attitudes, knowledge and skills, namely critical thinking, collaboration, communication, and creative thinking (Sopandi et al, 2021)

The RADEC learning model assisted by interactive games provides challenges for students with a learning process that is more fun and can be measured in real-time. This allows students to know the errors and shortcomings of their answers (Olisna et al, 2022. Interactive games positively increase student interest and motivation in learning. Interactive games enable students to collaborate and exchange ideas in solving problems in the learning process (Candra et al, 2021; Nurnaningsih et al, 2023; Ramadini et al; 2021; Savitriana et al, 2023).

CONCLUSION

Based on the research results, it can be concluded that the RADEC model assisted by interactive games is effective in increasing mastery of basic science concepts in elementary school teacher candidates compared to conventional learning methods such as collaborative learning. The average post-tests score in the experimental class increased significantly from 62.5 to 84.17 (post-tests), higher than the control class which only increased from 63.17 to 68.5. The syntax of the RADEC model (Read, Answer, Discuss, Explain, and Create) encourages students to be more active in learning, improving critical thinking, creative and collaboration skills. The use of interactive games as a supporting medium makes the learning process more enjoyable, increases learning motivation and helps students understand concepts in more depth. Thus, implementing the RADEC learning model assisted by interactive games can be an alternative solution to improve students' mastery of basic elementary science concepts.

REFERENCE

Aini, A. N., & Rulviana, V. (2023). Upaya Meningkatkan Motivasi Belajar dan Pemahaman Konsep IPS Siswa Melalui Media Game Interaktif Wordwall. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, *8*(1), 1038-1049.

Candra, A. M., & Rahayu, T. S. (2021). Pengembangan Media Pembelajaran Berbasis Game Interaktif untuk Meningkatkan Kemampuan Pemecahan Masalah Tematik di Sekolah Dasar. Jurnal Basicedu, 5(4), 2311-2321.

Eliza, D., & Karmila, D. (2021). Pengaruh Game Interaktif Berbasis Model Pembelajaran Inkuiri Terhadap Kemampuan Digital Literacy di Taman Kanak-kanak Pertiwi III Ladang Panjang Kabupaten Merangin. Jurnal Pendidikan Tambusai, 5(3), 9737–9744.

Fuziani, I., Istianti, T., & Arifin, M. H. (2021). Penerapan Model Pembelajaran Radec dalam Merancang Kegiatan Pembelajaran Keberagaman Budaya di SD Kelas IV. Jurnal Pendidikan Tambusai, 5(3), 8319-8326.

Guiao, C. D., & Caballes, D. G. (2023). Teachers' perception on integrating historical vignettes in teaching science concepts. International Journal of Innovative Science and Research Technology, 8(1), 1985-1990.

Handayani, H., Sopandi, W., Syaodih, E., Setiawan, D., & Suhendra, I. (2019). Dampak perlakuan model pembelajaran radec bagi calon guru terhadap kemampuan merencanakan pembelajaran di sekolah dasar. Pendas: Jurnal Ilmiah Pendidikan Dasar, 4(1), 79-93.

Laine, T. H., & Lindberg, R. S. (2020). Designing engaging games for education: A systematic literature review on game motivators and design principles. IEEE Transactions on Learning Technologies, 13(4), 804-821.

Nurnaningsih, N., Hanum, C. B., Sopandi, W., & Sujana, A. (2023). Keterampilan Berpikir Kritis dan Berpikir Kreatif Siswa Sekolah Dasar dalam Pembelajaran Berbasis RADEC. Jurnal Basicedu, 7(1), 872-879.

Olisna, O., Zannah, M., Sukma, A., & Aeni, A. N. (2022). Pengembangan Game Interaktif Wordwall untuk Meningkatkan Akhlak Terpuji Siswa Sekolah Dasar. Jurnal Basicedu, 6(3), 4133-4143.

Pohan, A. A., Abidin, Y., & Sastromiharjo, A. (2020). Model Pembelajaran RADEC dalam Pembelajaran Membaca Pemahaman Siswa. In *Seminar Internasional Riksa Bahasa* (pp. 250-258).

Pratiwi, N., Sopandi, W., & Rosdiono, M. (2018). The Students' Conceptual Understandings on Global Warming through Read-Answer-Disscuss-Explain-and Create (RADEC) Learning. Proceedings of International Conference on Elementary Education, 635–639

Putri, C. A., & Zulfadewina, Z. (2023). Pengaruh Model Pembelajaran RADEC berbasis STEAM terhadap Literasi Sains Siswa Kelas IV Sekolah Dasar. Jurnal Elementaria Edukasia, 6(3), 1162–1170.

Rahma, R., & Nurhayati, N. (2021). Pengembangan Media Interaktif Berbasis Game Edukasi Pada Pembelajaran Matematika. *Jemas: Jurnal Edukasi Matematika dan Sains*, *2*(1), 38-41.

Ramadini, R., Murniviyanti, L., & Fakhrudi, A. (2021). Efektivitas Model Pembelajaran RADEC Terhadap Kemampuan Menulis Teks Eksplanasi Siswa Di SD Negeri 06 Payung. EduMaspul: Jurnal Pendidikan, 5(2), 99-104.

Rosidah, R., Nizaar, M., Muhardini, S., Haifaturrahmah, H., & Mariyati, Y. (2022, July). Efektifitas Media Pembelajaran Game interaktif Berbasis Power Point Untuk Meningkatkan Motivasi Belajar Siswa Kelas V SD. In Seminar Nasional Paedagoria (Vol. 2, pp. 10-16).

Sari, N., & Sukmawati, W. (2023). Pengaruh Penerapan Model Pembelajaran RADEC terhadap Penguasaan Konsep Sistem Peredaran Darah Manusia pada Siswa Kelas V SD. Ideas: Jurnal Pendidikan, Sosial, dan Budaya, 9(4), 1257-1266.

Satria, E., & Sopandi, W. (2019, October). Applying RADEC model in science learning to promoting students' critical thinking in elementary school. In *Journal of Physics: Conference Series* (Vol. 1321, No. 3, p. 032102). IOP Publishing.

Savitriana, H., Anjarwati, P., Ayu Kartika, R., & Nurhaliza, S. (2023). Model Pembelajaran RADEC Sebagai Alternatif Dalam Meningkatkan Higher Order Thingking Skill Pada Pembelajaran Ipa Di Sekolah Dasar: a systematic literature. JIMU:Jurnal Ilmiah Multidisipliner, 1(1), 17–30.

Sopandi, W., & Handayani, H. (2019). The Impact of Workshop on Implementation of (RADEC) Learning Model on Pedagogic Competency of Elementary School Teachers. International Conference of Innovation in Education (ICoIE) 178, pp. 7-11

Sukmawati, D., Sopandi, W., Sujana, A., & Muharam, A. (2021). Kemunculan Aspek Karakter Siswa SD melalui Pembelajaran RADEC dengan Menggunakan WhatsApp pada Materi Siklus Air. Jurnal Basicedu, 5(4), 1787-1798.

Supriyono, H. (2018). Penerapan Game Edukatif untuk Meningkatkan Motivasi Belajar Siswa Setingkat Madrasah Ibtidaiyah. *Warta LPM*, *21*(2), 30-39.

Tulljanah, R., & Amini, R. (2021). Model Pembelajaran RADEC sebagai Alternatif dalam Meningkatkan Higher Order Thinking Skill pada Pembelajaran IPA di Sekolah Dasar: Systematic Review. Jurnal Basicedu, 5(6), 5508–5519.

Yulianti, Y., Lestari, H., & Rahmawati, I. (2022). Penerapan model pembelajaran RADEC terhadap peningkatan kemampuan berpikir kritis siswa. *Jurnal Cakrawala Pendas*, *8*(1), 47-56.

Zhan, Z., Tong, Y., Lan, X., & Zhong, B. (2022). A systematic literature review of game-based learning in Artificial Intelligence education. Interactive Learning Environments, 1-22.