



Research Paper

## Discovery Mathematics Learning: BuntangKaleng Traditional Games in Junior High School

SilviaFitriani<sup>1,\*</sup>, Asrial<sup>2</sup>, Kamid<sup>3</sup>, Maison<sup>4</sup>

<sup>1</sup> Universitas Batanghari, Jambi, Indonesia

<sup>2,3,4</sup> Universitas Jambi, Jambi, Indonesia

### ABSTRACT

The aim of this design was to learning trajectory and post-test questions. In the first activity, the students can analyze and solve problems in planning buntangkaleng Traditional games with positive integer fraction. The research subjects were 20 students of grade 2 from a junior high school in Jambi. This study resulted in a learning trajectory and post-test questions. In the first activity, the students can analyze and solve problems in planning planningbuntangkaleng Traditional games with material a positive integer fraction

**KEYWORD:** BuntangKaleng Traditional Games, Discovery Learning, Design Reserach

Received 08 November, 2021; Revised: 22 November, 2021; Accepted 24 November, 2021 © The author(s) 2021. Published with open access at [www.questjournals.org](http://www.questjournals.org)

### I. INTRODUCTION

Skills in the 21st century are creativity and innovation, critical thinking and problem solving, communication and collaboration. The importance of preparing students for mathematical literacy as well as by equipping students with 21st century competencies (MOE, 2014). Thus, to achieve the objectives of elementary and secondary school competence, mathematical literacy and 21st century skills, it can be achieved by learning mathematics ethnomathematics in schools. Elementary school is an educational environment in which all children must begin the meaningful development of ethnomathematics (Carpenter & Romberg, 2004; Jones, Langrall, Thorton, & Nisbet, 2002; Lehrer & Schaubel, 2003; National Council of Teacher of Mathematics (NCTM), 2000).

Regarding to data PISA (Program for International Student Assessment) is a three-year evaluation program organized by the OECD (Organization for Economic Co-operation & development) for students aged 15 years, namely the age at which students are nearing the end of compulsory school age and have obtained sufficient knowledge and skills to participate in modern society (OECD, 2015) proves that Indonesia has participated in the PISA program since 2000, but the results have not been satisfactory. Indonesia is almost always at the bottom. Indonesia's achievement in the field of Mathematics at the beginning of its participation in 2000 was ranked 39 out of 41 countries. Likewise, achievements in mathematics in 2003, Indonesia ranked 38 out of 40, ranked 50 out of 57 countries in 2007, ranked 61 out of 65 countries (Wardono, et al, 2015) and in 2012, Indonesia's rank was 64 out of 65 countries (Kompas, 5 December 2013). Indonesia's ranking in 2015 was 63 out of 69 countries evaluated. Indonesia's ranking and average score are not much different from the results of the previous PISA test and survey in 2012 which were also in the low material mastery group. It has been discussed in policy documents such as the Principles and Standards for School Mathematics by the National Council Teachers of Mathematics (2000); in research literature such as Bright Harvey, and Wheeler (1987) and Kamii and Houseman (2000).

Based on the results of research on the effectiveness of games in teaching to help students learn mathematics, there are four assumptions that the right game is used in the right way. First, from the results of these studies that games can facilitate the construction of mathematical understanding and meaning (Kamii & Livingston, 1994; Kamii & Houseman, 2000; Kamii Rummelsburg & Kari, 2005). Second, games are useful in helping students understand mathematics at different times during teaching when introducing new mathematical ideas and skills, in new mathematical ideas and skills are developed immediately after teaching, in students practice using newly acquired mathematical understanding and skills, and after long-term teaching, to maintain mathematical understanding and skills (Bright, Harvey, & Wheeler, 1985). Third, games can help students learn

mathematics about basic level functions such as remembering facts that in each question and answer are related, at a further level of understanding, students can interpret mathematical concepts and algorithms, students interpret mathematical concepts and algorithms, and students learn to solve problems, create and analyze mathematical proofs (1985). The four math games that students take home to play with their parents or playmates can create a diverse and fun math experience for families to share, so parents believe that children learn from games and enjoy, observe, and participate in learning. students (Kliman, 2006).

## **II. METHOD**

This research used ADDIE research with formative evaluation. This research is a type of research aimed at producing an integrated discovery learning model of the traditional game of BintangKaleng Jambi for understanding the concept of fractions and students' character in learning mathematics in class VII of Junior High School. This research consisted of three stages, namely the preliminary stage, the prototyping stage, and the assessment stage (Nieveen&Plomp, 2007). In the prototyping stage of the evaluation flow using formative evaluation, the phases carried out include self-evaluation, expert and one-to-one reviews, and small groups, as well as field tests. Meanwhile, to analyze the previous two stages using the assessment stage (Tessmer, 1993; Zulkardi 2006; Permatasari, Putri, Zulkardi, 2018).

## **III. RESULTS AND DISCUSSION**

This research has produced an integrated discovery learning model of BintangKaleng traditional game to understand the concept of integer and fractional arithmetic operations by utilizing various valid and practical properties of integer operations and has a potential effect on understanding the concept of arithmetic operations on integers and fractions by utilizing various properties of operations and students' characters.

The research procedures carried out in this study are the preliminary stage, the prototyping stage, and the assessment stage. In the prototyping stage of the evaluation flow using formative evaluation, the phases carried out include self-evaluation, expert review and one-to-one, and small group, as well as field tests. In the preliminary stage, the researchers analyse the ability of students in learning mathematics and their interest in traditional games from the Jambi area. In addition, to analyse aspects of the traditional game of BintangKaleng that are related to the mathematics material for grade VII of junior high school based on the 2013 curriculum

At the self-evaluation stage, the assessment was conducted by the researcher on the design of integrated discovery learning model of the traditional game of BintangKaleng Jambi for understanding the concepts and characters of students that have been developed in terms of content, construct, and language. Prototype 1 made by researchers and which will be validated by expert reviews and students at the one-to-one stage.

In the prototyping stage, prototype 1 that has been made is validated to experts, then tested at the one to one stage and then to the small group stage with the aim of seeing the validity and practicality of the integrated discovery learning model of the traditional game BintangKaleng Jambi on the material of arithmetic operations on integers and fractions by utilizing various properties of operations that have been designed. Validity is seen from expert review comments/suggestions based on the suitability of reading texts and questions presented on student activity sheets according to content, construct, and language.

In the expert review, the researcher asked for the suggestions of experts who have experience in mathematics education, namely professors at mathematics education study program at Padang University, lecturers at mathematics education study program at SebelasMaret University, and mathematics teacher from the research school.

Based on the implementation of the Expert Review at the one to one stage. Prototype 1 was tested on one student who is not a research subject. The purpose of this trial is to find out the responses and difficulties that students will face when playing the traditional BintangKaleng game or answering questions on the activity sheet. The responses and difficulties observed were focused on answering the statement of student activity sheets along with the post-test. After the implementation of the trial, the researcher gave the students the opportunity to provide comments and suggestions regarding the activity sheets that had been done. The results from the Expert Review and one to one stage show that the traditional game activity of BintangKaleng which is integrated into discovery learning for understanding this concept is valid (Effendi et al, 2018). The following activities for the traditional game of BintangKaleng are carried out as shown in Figure 1



**FIGURE 1.** Student playing the BintangKaleng game

At the stimulation stage, the researcher acts as a teacher to provide stimulation in the form of pictures on the student activity sheet and the topic of understanding fraction concepts, at this stage the researcher who acts as a teacher gives questions to students as follows:

Students are asked to observe the display of pictures presented by the teacher

Teacher: Students, look at the picture that is displayed in front of the class.

Teacher : Have you ever seen or even played traditional games like the picture you showed?

Student : Never ma'am

Teacher: student, does anyone know the name of the traditional game?

Student: (just shakes head)

At the Stimulation learning stage (providing stimulation) strengthening the character are communicative (friendly), tolerance and curiosity are achieved.

Problem statement (question/problem identification), researchers provide opportunities for students to identify as many questions as possible related to the images presented and will be answered through learning activities as shown in Figure 2

Teacher : From the picture of BintangKaleng traditional game, the students have to try to make some questions related to the game

Student :

1. Setelah melihat tanyangan gambar, coba buat pertanyaan setiap masing-masing anggota kelompok, dan diskusikan

Nama siswa	Pertanyaan
	Bagaimana cara memainkan bintang Kaleng

The strengthening of student scores on creative character that purposed by the teacher at this stage is that students are able to think to make questions related to the traditional game of BintangKaleng. This is evident from the student activity sheet being able to make questions on picture 2

In data collection, students perform traditional game activities of BintangKaleng. Such a picture 3



**Figure 2:** student playing the BintangKaleng game

Strengthening the value of the character of responsibility is achieved, namely students are responsible for collecting data according to the activity sheet given by the teacher.

Data processing, which is carried out by students from the results of data collection activities, students in their respective groups conduct discussions, and manage data. At this stage, the results of the activities carried out by students are as follows:

9. Pemain pertama berhasil menjatuhkan  
 $\frac{3}{6}$  dari kaleng berwarna merah  
 $\frac{1}{5}$  dari kaleng berwarna kuning  
 $\frac{1}{4}$  dari kaleng berwarna biru

Figure 4. students sheet **playing BintangKaleng games**

The achievement of honest character scores in accordance with the teacher's purpose at this stage is that students are able to manage the data obtained from data collection. The data in question can be in the form of student observations of falling cans while playing the traditional game of BintangKaleng, strengthening score of the curiosity character by the teacher to students, namely the curiosity of students completing the questions contained on the student activity sheet. The strengthening score of the responsibility character achieved by the teacher is that students are responsible for managing data according to the activity sheet provided by the teacher.

Verification, students are still working on the activity sheet but the questions are given to students to verify from the activities that have been carried out by students so that from the students' answers it can be seen that they understand the concept of positive integer fractions. The following are the results of the student activity answers in the verification stage of Figure 5

10. Berdasarkan gambar susunan kaleng yang telah kalian gambarkan , jika pemain pertama berhasil menjatuhkan  $\frac{1}{2}$  dari kaleng berwarna merah,  $\frac{1}{5}$  dari kaleng berwarna kuning dan  $\frac{1}{2}$  dari kaleng berwarna biru, maka berikanlah strategimu berapa banyak kaleng yang harus dijatuhkan oleh pemain kedua agar bisa menjadi pemenang dalam permainan ini kemudian simpulkan!

.....  
 Merah =  $\frac{3}{6}$   
 Biru =  $\frac{1}{2}$   
 Kuning =  $\frac{1}{5}$   
 .....

The strengthening of character scores purposed by the teacher to students are honesty, curiosity, and responsibility. It can be seen from the activities carried out by students in completing the learning of multiplication of positive integers.

In the closing activity, generalization (drawing conclusions) students make conclusions regarding the material of positive integer fractions, which are delivered orally. The strengthening score of honest characters purposed by the teacher at this stage is that students are able to conclude the concept of fractions. The strengthening score of the responsibility character purposed by the teacher is that students are responsible for the results concluded from the integrated learning activity of traditional game BintangKaleng traditional game.

#### IV. CONCLUSION

Based on the findings, the product is the integrated discovery learning model of BintangKaleng traditional game. The validity is described based on the validator's assessment in terms of content, construct, and language. Practicality is illustrated from the results of test at the small group stage, namely the learning model designed to have three practical aspects, such as convenience, usability, and interest. The integrated discovery learning model of BintangKaleng traditional game has a potential effect on understanding concepts in the material for arithmetic operations on integers and fractions by utilizing various properties of integer operations and the character of the seventh grade students of junior high school in one of the junior high schools in Jambi city, as seen from the percentage of assessment when students carry out discovery learning activities integrated with traditional Jambi games. Further, it can be seen that 85% of students have been able to work very well on each worksheet individually, 100% collaborate in learning, 80%, when asking for help from friends, 55% of students have actively expressed opinions, 100% of students show enthusiasm in learning discovery learning integrated Jambi traditional games, 85% of students have been able to conclude the learning process.



## REFERENCES

- [1]. Akker, J.v.d. 1999. Principles and Methods of Development Research. Dalam J.v.d Akker (Ed). *Desain Approaches and Tools in Education and Training*. Dordrecht: Kluwer Academic Publisher.
- [2]. Ariyana, Y., Pudjiastuti, A., Bestary, R., & Zamroni. (2018). *Buku Pegangan Pembelajaran Berorientasi pada Keterampilan Berpikir Tingkat Tinggi*. Direktorat Jenderal Guru dan Tenaga Kependidikan Kementerian Pendidikan dan Kebudayaan.
- [3]. Asmani, J. M. (2013). *Buku panduan internalisasi pendidikan karakter di sekolah*. Yogyakarta: Diva Press.
- [4]. Asyanti, S. (2012). Pendidikan karakter di perguruan tinggi: Sudah terlambatkah? *Prosiding Seminar Nasional Psikologi Islami*, 21, 284-291.
- [5]. Aunillah, N. I. (2011). *Panduan menerapkan pendidikan karakter di sekolah*. Jakarta: Laksana.
- [6]. Baehr, J. (2016). Is intellectual character growth a realistic educational aim? *Journal of Moral Education*, 8, 1-16
- [7]. Barton, W. D. (1996). *Ethnomathematics: Exploring Cultural Diversity in Mathematics*
- [8]. *Doctor of Philosophy in Mathematics Education*, The University of Auckland.
- [9]. Bryant, J. (2009). Problem Solving through Communication. [Online]. Tersedia: <http://www.yale.edu/ynhti/curriculum/units/2004/5/04.05.06.x>.
- [10]. Bambang Suwondo, Y., & Singgih Wibisono (1983). *Permainan Anak-Anak Daerah Jambi*. Jambi: Departemen Pendidikan dan Kebudayaan.
- [11]. D'Ambrosio (2007). "Peace, social justice and ethnomathematics." *The Montana Mathematics Enthusiast*: 25-34.
- [12]. Dikti. (2014). *Standar nasional pendidikan tinggi*. Jakarta
- [13]. De Lange, J. (2004). *Mathematical Literacy for Living from OECD-PISA Perspective*. Paris: OECD-PISA
- [14]. Djaali dan Muljono, Pudji. 2008. *Pengukuran dalam Bidang Pendidikan*. Jakarta: Grasindo.
- [15]. Ewawarni (2008). *Kerajinan Anyaman Pandan di Jambi*. Tanjung Pinang, Departemen Kebudayaan dan Pariwisata Balai Pelestarian Sejarah dan Nilai Tradisional Tanjung Pinang
- [16]. Fadlillah. (2017). *Bermain dan Permainan Anak Usia Dini*. Jakarta: Kencana.
- [17]. Fathurrohman, P., Suryana, A. A., & Fatriany, F. (2013). *Pengembangan pendidikan karakter*. Bandung: Refika Aditama.
- [18]. Fogarty, R. (1997). *Problem-Based Learning and other Curriculum Models for the Multiple Intelligences Classroom*. Australia: Hawker Brownlow
- [19]. Gede, R., Mulyana, Y., Markam, S. S., Semiawan, C. R., Hasan, S. H., Bastaman, H. D., & Nurachman, N. (2011). *Pendidikan karakter di sekolah*. Jakarta: ElekMedia Kompetindo.
- [20]. Harrington, N. G., Giles, S. M., Hoyle, R. H., Feeney, G. J., & Yungbluth, S. C. (2001). Evaluation of the all stars character education and problem behavior prevention program: Effects on mediator and outcome variables for middle school students. *Health Education & Behavior*, 28 (5), 533-546.
- [21]. Hartatiana. 2010. *Pengembangan Soal Pemecahan Masalah Berbasis Argumen untuk Siswa Kelas V SD N 79 Palembang*. Tesis. Jurusan Pendidikan Matematika Pascasarjana UNSRI
- [22]. Kartadinata, S. (2013). *Kerangka pikir pemberdayaan bimbingan dan konseling dalam implementasi kurikulum 2013: Sebuah proposal kebijakan*. Seminar Implementasi Bimbingan dan Konseling dalam Kurikulum 2013. UPI Bandung.
- [23]. Kamii C., dan Housman, L. (2000). *Young Children Continue to Reinvent Arithmetic: Implications of Piaget's Theory*. New York: Teachers College Press.
- [24]. Kamii C., Rummelsburg, J., & Kari, A. (2005). "Teaching Arithmetic to Low-Performing, Low-SES First Graders." *Journal of Mathematical Behaviour*, 24, 23-50.
- [25]. Kemendiknas. (2010). *Pedoman pelaksanaan pendidikan karakter*. Jakarta: Pusat Kurikulum.
- [26]. Kemendikbud. (2013). *Materi Pelatihan Guru Implementasi Kurikulum 2013 SMP/MTs Matematika. Badan Pengembangan Sumber Daya Manusia Pendidikan dan Kebudayaan dan Penjaminan Mutu Pendidikan Kementerian Pendidikan dan Kebudayaan*. Jakarta: Kemdikbud.
- [27]. Kemendikbud. (2013). *Pengembangan kurikulum 2013*. Jakarta: Kementerian Pendidikan dan Kebudayaan.
- [28]. Kemendikbud. (2013). *Permendikbud No. 66 Tahun 2013 Tentang Standar Penilaian Pendidikan*. Jakarta: Kemendikbud
- [29]. Kliman, M. (2006). "Math out of Scholl: Families' Math Game Playing at Home." *School Community Journal*, 16(2), 69-90.
- [30]. Koentjaraningrat. (2009). *Pengantar Ilmu Antropologi*. Jakarta: Aksara Baru.
- [31]. Krathwohl. 1997. *Methods of Educational and Social Science Research, Second Edition*. New York: Longman, Inc.
- [32]. Lapsley, D., & Woodbury, R. (2016). Moral character development for teacher education. *Action in Teacher Education*, 38 (3), 194-206.
- [33]. Lickona, T. (2012). Character education: Seven crucial issues. *Action in Teacher Education*, 06, 77-84.
- [34]. Mahmud. (2014). *Pendidikan karakter*. Bandung: Alfabeta.
- [35]. Mardhiyanti, Devi. 2011. *Pengembangan Soal Matematika Model PISA untuk Mengukur Kemampuan Komunikasi Matematis Siswa Sekolah Dasar*. Tesis. Jurusan Pendidikan Matematika Pascasarjana UNSRI
- [36]. Marzuki. (2013). *Pengintegrasian pendidikan karakter dalam pembelajaran di sekolah*. Yogyakarta: FIS Universitas Negeri Yogyakarta.
- [37]. Mukhibat. (2012). Reinventing nilai-nilai Islam, budaya, dan Pancasila dalam pengembangan pendidikan karakter. *Jurnal Pendidikan Islam*, 1 (2), 247-265.
- [38]. Nopiyanti. 2010. *Pengembangan LKS Berbasis Argumen untuk Melatih Siswa Menyelesaikan Soal-soal Pembuktian Pada Mata Pelajaran Matematika di SMP Xaverius 1 Palembang*. Tesis. Jurusan Pendidikan Matematika Pascasarjana UNSRI
- [39]. Noor, J. T. (2011). *Mencari Jejak Sangkala*. Jambi, pusat Kajian Pengembangan Sejarah dan Budaya Jambi.
- [40]. Rahman, H. S. A. (1992). *Warisan Seni Kerajaan Melayu Dalam Konteks Kronologi dan Budaya di Lembah Sungai Batanghari*. seminar sejarah malayukuno.
- [41]. Rahyono, F. X. (2009). *Kearifan Budaya dalam Kata*. Jakarta: Wedatama Widya Sastra.
- [42]. Rusdi, M. (2018). *Penelitian Desain dan Pengembangan Kependidikan (Konsep, Prosedur dan Sintesis Pengetahuan Baru) (1 ed.)*. Depok: PT Rajagrafindo Persada.
- [43]. Saudagar, F. (2013). *Memasuki Gerbang Situs Sejarah Candi Muaro Jambi Pusat Kerajaan Melayu, Sriwijaya, dan Pusat Pendidikan Agama Buddha*. Yayasan FORKKAT Jambi.
- [44]. Samani, M., & Hariyanto. (2016). *Konsep dan model pendidikan karakter*. Bandung: Remaja Rosda Karya.
- [45]. Stephens, J. M., & Wangaard, D. B. (2016). The achieving with integrity seminar: An integrative approach to promoting moral development in secondary school classrooms. *International Journal for Educational Integrity*, 1-16.
- [46]. Stacey, K. (2010). Mathematical and scientific literacy around the world. *Journal of Science and Mathematics Education in Southeast Asia*, 33(1), 1-16.
- [47]. Stiff, H. R., & Williams (2010). Widening the lens to teach character education alongside standards curriculum. *The Clearing House*, 8, 115-120

- [48]. Somad, K. A. (2002). *MengenalAdat Jambi DalamPerspektif Modern*. Jambi, DinasPendidikanProvinsi Jambi.
- [49]. Sunarto, A.S. (2013). Aktualisasipendidikankarakterdalam proses pembelajaranmatakuliah umum (MKU) di UniversitasNegeri Semarang. *JurnalPenelitianPendidikan*, 30 (1), 73-86.
- [50]. TaridaDiami, N. H. P., Yanto H.M Manurung, &KhairulAfdhal (2007).*PeninggalanPeradaban Jambi " Situsdan Benda CagarBudaya"*. Jambi, DinasKebudayaanProvinsi Jambi.
- [51]. Tessmer, M. (1993).*Planning and Conducting – Formative Evaluations*. London, Philadelphia: Kogan Page.
- [52]. Undang-UndangRepublik Indonesia Nomor 12 (2012).*Pendidikantinggi*. Jakarta: Dikti.
- [53]. Undang-UndangRepublik Indonesia Nomor 20 (2003).*Sistempendidikannasional*. Jakarta: Depdiknas.
- [54]. White, B. (2015). Scapegoat: John dewey and the character education crisis. *Journal of Moral Education*, 44 (2), 127-144.
- [55]. Zulkardi.(2000). How To Design Mathematics Lesson Based On The Realistic Approach.Tersedia:<http://www.geocities.com/ratuilma/rme.html>.
- [56]. Zulkardi. (2002). Developing a learning environment on realistic mathematics education for Indonesian student teachers. DisertasiDoktor, University of Twente, Enschede.
- [57]. Zulkardi. (2003). Developing a 'rich' learning environment on Realistic Mathematics Education (RME) for student teachers in Indonesia. International Journal of Indonesian Mathematics Society (MIHMI).
- [58]. Zulkardi.(2010). How to design mathematics lessons based on the realistic.Diaksesdari<http://www.reocities.com/ratuilma/rme.html>.
- [59]. Zulkardi, &Putri, R. I. I. (2006).Mendesainsendirisoalkontekstualmatematika.*ProsidingKonferensiNasionalMatematika ke-13 (KNM13)*. Semarang.
- [60]. Zulkardi, &Putri, R. I. I. (2014).Pengembangan blog support untukmembantusiswadan guru matematika Indonesia belajarPendidikanMatematikaRealistik Indonesia (PMRI). *JurnalInovasiPerekayasaPendidikan (JIPP)*, 2(1), 1-24