

## DEVELOPMENT OF CHEMDOMINO MEDIA TO TRAIN SOCIAL SKILLS IN REDOX LESSON OF CLASS X SMA

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### Abstrak

Penelitian ini bertujuan untuk mengetahui kelayakan media permainan ChemDomino yang dikembangkan pada materi redoks yang diujicobakan pada 34 siswa kelas X-2 SMAN 15 Surabaya. Rancangan penelitian mengikuti model R&D (Research and Development). Proses pemilihan media menggunakan metode ASSURE dengan hanya mengambil 3 tahap pertama saja: Analyze Learner, State Objectives, Select Methods, Media and Materials. Rancangan media ditelaah oleh 1 dosen kimia Universitas Negeri Surabaya dan 2 guru SMAN 15 Surabaya. Validasi media dilakukan oleh 2 dosen kimia Universitas Negeri Surabaya dan 1 guru SMAN 15 Surabaya. Hasil penelitian menunjukkan bahwa media permainan ChemDomino layak untuk digunakan sebagai media pembelajaran. Rata-rata hasil validasi media adalah 85,61% yang berarti media termasuk dalam kategori sangat layak. Keterampilan sosial yang dilatihkan dalam uji coba media permainan ChemDomino kepada para siswa berhasil 100%. Pada keterampilan bekerja sama, persentase jumlah siswa yang mendapat predikat A sebesar 73,5% sedangkan yang berpredikat B sebesar 26,5%. Pada keterampilan berkomunikasi, persentase jumlah siswa yang mendapat predikat A sebesar 32,4% sedangkan yang berpredikat B sebesar 67,6%. Hasil belajar mengalami peningkatan dari sebelum dan sesudah pemberian media permainan, yang tampak dari peningkatan rata-rata nilai pretest kelas sebesar 65,49 dan rata-rata nilai posttest sebesar 84,9.

**Kata kunci:** permainan ChemDomino, keterampilan sosial, redoks, hasil belajar

### Abstract

This research was done to know feasibility of ChemDomino game media was developed for redox topic which was tested to 34 students of class X-2 of SMAN 15 Surabaya. Research design used R&D model (Research and Development). Selecting process of developed media was done by using ASSURE method limited 3 first steps: Analyze Learner, State Objectives, Select Methods, Media and Materials. Media design was reviewed by 1 chemistry lecturer of Surabaya State University and 2 teachers of SMAN 15 Surabaya. Media validation was done by 2 chemistry lecturers of Surabaya State University and 1 teacher of SMAN 15 Surabaya. The result showed that ChemDomino game media was feasible to be used as learning media. Validation average score was 85.61%. It meant media was very feasible. Social skills that practiced to students were 100% success. In cooperation skill, total percentage in A category was 73.5% while in B category was 26.5%. In communication skill, total percentage of students in A category was 32.4% while in B category was 67.6%. Learning outcomes increased before and after game was given, observed from increasing the average of pretest score which was 65.49 and average of posttest score which was 84.9.

**Keywords:** ChemDomino game, social skills, redox, learning outcomes

### INTRODUCTION

Based on the Minister of National Education Regulation No. 22 of 2006, curriculum is implemented by using natural, social, cultural conditions and regional wealth. Teacher as educator has important role in learning process because they must have new innovation in choosing, using learning model and learning media that will influence success of learning. Measuring the success or failure of a lesson can be seen from the learning outcomes. But keep in mind, that assessing the results should be done carefully and precisely that takes more attention into the process. In this process students will move to the right or not right process so maybe the outcome would not be good or may be said that the result is a false result [7].

By using media in learning, students can feel comfortable and enjoy the learning process which is ongoing. Learning media can help students to understand

and remember information. Moreover, game is important for children because game can train cognitive skills of students. When someone is playing, he will feel free without any pressure so that he can express and give opinion as he wish [7]. The game can be used as a medium of learning if the game aims to achieve learning objectives. Therefore, by combining learning with playing activities can be one way to provide a pleasant atmosphere during learning activities.

Based on the results of pre-study questionnaire on 10 students of SMAN 15 Surabaya at random, it is found that 70% of students likes chemistry subject, 60% of students states that redox lesson is the most difficult lesson, and 100% of students say they want to learn chemistry by supporting the game media. Based on interview with teacher, classical mastery learning of students's test is 50% with average grade ranges at 60-70, so the score is still under the passing grade which is 75.

In addition, students often have difficulty in determining the oxidation state of the specific compounds such as peroxide. Games like mahjong and tile games chemistry can help students to repeat and recall concepts they have learned [1]. The age of students in tenth grade is 15-16 years old, so according to Piaget they have entered the stage of formal operation. However, they are still in the stage of transition from junior high school to senior high school, so the use of game media is suitable for students.

Game can also be used to train social skills of groups if it is done in groups, the members should be able to make their teams become solid teams and resolve disagreements that may occur. To achieve this, it needs cooperation skill, as well as good communication skill so that no misunderstandings between members. Based on Vygotsky's theory in Nur (1999), the social interaction with friends will be done well by using game media because this game is done in groups. Social interaction with others can develop new ideas and enrich student's intellectual development [4]. ChemDomino game can be used to train social skills in communication and cooperation skills because it is done in groups.

According to Gagne in Dahar (1991), attitude is a trait that can be learned and affect a person's behavior toward objects, events or other living creatures. A group of important attitudes according to Gagne is our attitude toward others or social attitudes [2]. Social attitudes can be learned by students, for example, discussing and answering questions within the time limit specified in groups. It can train students' ability to cooperate and communicate with their friends. Cooperating and communicating are some aspects of social skills.

Development of social skills is important because education is not only teaching the academic competence, but also other skills developing, such as soft skills. Soft skill is one realm of social skills, which are needed for students when entering the occupational world and life community [5].

According to the PP. 19 of 2005 Article 13 point (1), "curriculum for SMP / MTs / SMPLB or other forms of equals, SMA / MA / SMALB or other forms of equals, SMK / MAK or other equivalent forms may include life skills education". Point (2) life skills education as mentioned in point (1) includes personal skills, social skills, academic skills, and vocational skills.

Life skills education includes a combination of knowledge, values, attitudes, skills with an emphasis on skills related to critical thinking and problem solving, self-management, communication skills and interpersonal skills. Social skills are also found in the realm of soft skills. This is equivalent to soft skills and personal skills social skills. Soft skills are classified into two main attributes, they are personal attributes and interpersonal attributes [9]. Social skills are the skills to interact with others in a social context by a specific way

that is acceptable to the community. Behavioural social skills make social relation succeeds and allows a person to work effectively with others [5].

Communication and cooperation aspects are emphasized in this study because in the world of work and society, good communication and cooperation skills are needed to deal with the diverse personalities of community members. Social communication skill embedded here is the ability to contribute ideas or opinions in group discussions.

One of the important skills in the classroom is a skill to communicate effectively with other individuals. Communication is important because communication is necessary in order to exchange thoughts, feelings, information resources, through a conceptual experience the same representative for the people involved in it. Communication is an important step in partnership because the absence of effective communication between people with each other causes the collaboration group will not run either. Communication skills include verbal communication and non verbal communication. Verbal communication skills essential in the communication skills, especially in presenting ideas or opinions clearly and politely so that the person you are talking to understands the content of the speech delivered [10].

A process occurs in the group discussion when group members discuss to achieve the best results by maintaining effective working relationships. Each member of the group will try to continue to work together, interact, discuss and help each other with other individuals to create an effective group for achieving success together [11].

One way to improve social skills of students is by giving game media in learning process, especially a game that is done in groups. Domino is chosen in this research because game rule is easy and relatively quick and it also can be modified according to the indicators and learning objectives to be achieved. The players sit in a circle and just required to bring down the card in hand, according to the order of the numbers presented on both sides. If the player has no cards to offer, then the next player has the right to continue the game. Direction of rotation is appropriate and agreed by the game players, clockwise or opposite direction. In chemistry learning, it is needed to develop a media which is adapted to chemistry lesson.

The ChemDomino game has total of dots on the domino that shows a certain number. Dots on domino was replaced by question, statement, keyword, or specific image associated with the learning objectives of chemistry especially in redox.

ChemDomino game is played in groups by distributing cards to each member of group then arranging them to a closed arrangement. ChemDomino game will be divided into three rounds, the first round,

the bonus round, and second round. For the first and second round, each round is given 10 minutes, whereas bonus round is only 5 minutes. Group succeeded to arrange the card correctly in the first round get 130 points. If not, the group will earn points according to the number of correct pairs of cards. If in the first round there are some groups that fail to reach minimum score 100 points, they must enter bonus round, which is a sort of remedial for them. Bonus round if answered correctly will earn 90 points while second round if answered correctly will earn 170 points. The total of points in each question is different, depending on the level of difficulty of the question.

ChemDomino game can be used as a review after the end of redox lesson. This game can be used to repeat the concepts that have been taught so that students are easier to learn and understand chemistry concepts. Tile game that has a similar way of playing to ChemDomino by matching between concepts in the form of keywords as the game of dominoes, thus helping students to recall the material they have learned [1].

So, development of ChemDomino media as media for learning is needed. The problems of this research are:

1. How is the feasibility of developed ChemDomino game media for redox topic based on quality criteria of media, content, and language?
2. How are the social skills of student in communication and cooperation aspects when using ChemDomino game?
3. How is the increasing of learning outcomes by using developed ChemDomino game media?

## METHOD

This research was Research and Development type, consisting from step of pre-study, step of designing media and materials, review of media, validation, and examination step. Choosing of media used ASSURE with only taking 3 first steps of ASSURE which were Analyze Learner, State Objectives, Select Methods, Media and Materials.. Review of media was done by 1 chemistry lecturer and 2 chemistry teachers of SMAN 15 Surabaya by using reviewer sheet. Validation was done by 2 chemistry lecturers and 1 chemistry teacher of SMAN 15 Surabaya by using validator sheet.

$$\%P = \frac{\text{Total score of data collected}}{\text{Criterion score}} \times 100\% \quad (1)$$

Criterion score = Highest score x Total of aspects x Total of reviewer

Table 1. Likert Scale

Assesment	Score
Very Good	5
Good	4
Average	3
Bad	2
Very Bad	1

Analysis result of reviewer was used to determine feasibility of ChemDomino game media with score interpretation following:

Table 2. Score Interpretation

Percentage	Category
0% - 20 %	Very Less
21 % - 40 %	Less
41 % - 60 %	Enough
61 % - 80 %	Feasible
81 % - 100 %	Very Feasible

This research was done in class X-2 of SMAN 15 Surabaya. Social skills was observed by 3 observer during the game. Total of students in this class was 34 students. Using of ChemDomino game was done in groups consisted of 5 students whereas one group was only 4 students during learning activity, so total of groups in a class was 7 groups. Description of social skills could be calculated by this formula:

$$\%P = \frac{\sum \text{students who get certain score}}{\sum \text{students observed}} \times 100\% \quad (3)$$

The obtained result was interpreted as (A) very satisfying, (B) satisfying, (C) indicates progress, (D) requires repairment.

Data of learning outcomes was obtained from result of pretest and posttest. Pretest was done before game started while posttest was done after game finished. Learning outcomes was calculated by formula below [6]:

$$\text{Learning outcomes} = \frac{\sum \text{correct answers}}{\sum \text{question}} \times 100\% \quad (4)$$

## RESULT AND DISCUSSION

Table 3. Validation Result

No	Criteria	Lecturer 1's Validation Score	Lecturer 2's Validation Score	Teacher's Validation Score	Percentage (%)
1	Media format	14	12	13	86,67
2	Media appearance	17	18	18	88,33
3	Content	17	15	18	83,33
4	Question of game	16	16	20	86,67
5	Language	16	16	18	83,33

ChemDomino media is stated as feasible based on validation result because it is appropriate with feasibility criteria which is  $\geq 61\%$ , with the percentage is 85.61%.

Total score in media format criterium is 39 with percentage 86.67%. Based on likert scale it is included in range 81-100%. It is in very feasible category. According to aesthetical standards of Badru, this media is feasible because it has appropriate size of writings and readable. Based on Badru's technical standards, it is feasible because it is easy to use and increases happiness of children to experiment and explore.

Total score of media appearance criterium is 39 with percentage 88.33%. Based on likert scale it is included in range 81-100%. It is in very feasible category. According to aesthetical standards of Badru, this media is feasible because it has elastic form, light and easy to be brought with appropriate and interesting combination of color. Bright colors chosen as front part color of card so dark color of sentences in media are read clearly. Green theme in back part design is appropriate with design of group name board. It also fulfills technical standards which are safe, durable, strong, and long time-used.

Total score in content criterium is 50 with percentage 83.33%. According to likert scale it is included in range 81-100%. It is in very feasible category. Questions of game are appropriate with KTSP indicator for redox. Based on educative game characteristics of Fenrich, it is stated feasible because it can develop specific skills which is redox concepts and has various questions from C1 until C5, so it can increase cognitive aspect. It is appropriate with statement that games like mahjong and tile games chemistry can help students to repeat and recall concepts they have learned [1]. A group of important attitudes according to Gagne is our attitude toward others or social attitudes [2]. Social attitudes can be learned by students, for example, discussing and answering questions within the time limit specified in groups. It happens when ChemDomino is used in learning so it can increase affective aspect.

Total score in question of game criterium is 39 with percentage 86.67%. Based on likert scale, it is included in range 81-100%. It is in very feasible category. According to syllabus of redox lesson, questions in game are appropriate with its indicators. Media is stated as feasible because of various difficulty level from C1 to C5 with simple language, so it is easy to be understood by students of class X having age range 15-16 years. According to Piaget theory, it is age of formal operation stage, but it is also still a transition stage from middle school to high school. Various difficulty level of questions are given, but with simple language.

Total score in question of language criterium is 39 with percentage 83.33%. Based on likert scale, it is included in range 81-100%. It is in very feasible category. Based on technical standards of Badru, educative game tool is designed suitable with functional objectives (not creating misconception). Media is feasible because English which is used in questions and game rule are simplified, so it is easy to be understood by students. Sentences tends to be short, not too long and using well known English terms for students of class X. Same terms and same rule of writing chemical reactions are used in the whole of game's questions in order not to confusing students.

Social skills of student observed is good and no students get C or D. It shows that students are motivated

to cooperate and communicate with their friends to win the game. In cooperation skills, total percentage of students in A category is 73.5% while in B category is 26.5%. In communication skills, the percentage of students in A category is 32.4% while in B category is 67.6%.

ChemDomino game is applied by using a model of cooperative STAD and played in groups. Studying in groups can train students to work together, argue, and exchange opinions with friends. The rule of game can condition students to cooperate and communicate with friends in their group to win the game. Students have to arrange the card into the correct arrangement in limited time. This game can be used to train social skills, particularly on cooperation and communication.

It is consistent with Vygotsky's social learning theory which states that learning process occurs in children if the children work or handle tasks that have not been studied, yet still be within their range called the zone of proximal development area. It is slightly above the level of development of a person's development area in the present where higher mental functions generally comes up in conversation and cooperation between individuals before the higher mental functions are absorbed in the individual [5].

According to Gagne, social attitudes can be inculcated and practiced to students through appropriate learning activities. Because social skills that will be implanted are cooperation and communication, the students are conditioned to a situation where they have to work together and communicate with each other to achieve a certain goal [2].

Table 4. Score of Pretest and Posttest Results

	Average score	Σstudents	Σstudents reaching mastery learning	%
Pre	65.49	34	6	17.65%
Post	84.9	34	31	91.18%

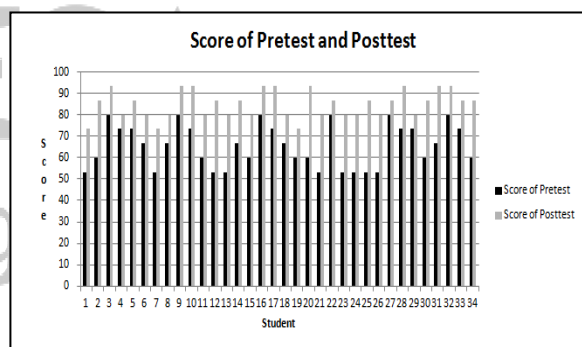


Figure 1. Score of Pretest and Posttest

Learning outcomes of students can be described like this. The class average of pretest score is 65.49 and average of posttest score is 84.9. It indicates increasing in student's learning outcomes because before media is

given average of pretest score is still below passing grade which is 75. Number of students who pass the pretest is 6 students, while at posttest it is significantly increased to 31 students. Increasing of learning outcomes is also observed from graphic of pretest and posttest score, which are all students experience increasing of score in posttest result.

ChemDomino game used with STAD cooperative learning model can condition the students in groups to exchange ideas and work together, so students can easily understand the concept, resulting in individual and classical mastery learning rise dramatically.

It is appropriate with Vygotsky's social learning theory which states that learning process occurs in children if the children work or handle tasks that have not been studied yet still be within their range called the zone of proximal development area. It is slightly above the level of development of a person's development area in the present where higher mental functions generally comes up in conversation and cooperation between individuals before the higher mental functions are absorbed in the individual. It is also supported by Fenrich that states a game could be effective, motivating and a fun way to learn so that learning outcomes can be increased [8]. It is also appropriate with statement that a game can be used to increase learning outcomes from 71.25 to 85.42 [12].

## CLOSURE

### Conclusion

Feasibility of ChemDomino game media was developed based on quality criteria of media, content and language had validation average score 85.61%. It meaned media was very feasible. In cooperation skill, total percentage of students in A category was 73.5%. In communication skill, total percentage in A category was 32.4%. Learning outcomes increased before and after game was given, observed from increasing the average of pretest score which was 65.49 and average of posttest score which was 84.9.

### Suggestion

Based on social skills data, improving communication aspect is more focused in the next research.

## REFERENCES

- 1) Chapman, Paige. 2010. A Game Eases the Pain of Cramming for Chemistry. *The Chronicle of Higher Education Journal*.
- 2) Dahar, Ratna Wilis. 1991. *Teori-Teori Belajar*. Jakarta: Penerbit Erlangga.
- 3) Departemen Pendidikan Nasional. 2005. *Pedoman Pembelajaran Matematika Dan IPA Dalam Bahasa Inggris (Bilingual)*. Jakarta: Departemen Pendidikan Nasional Direktorat Pendidikan Lanjutan Pertama.
- 4) Nur, Mohamad. 1999. *Teori Belajar*. Surabaya : Unipress
- 5) Rahmawati, Ayu dan Yonata, Bertha. 2012. Keterampilan Sosial Siswa Pada Materi Reaksi Reduksi Oksidasi Melalui Penerapan Model Pembelajaran Kooperatif Tipe Numbered Heads Together (NHT) SMA Negeri 9 Surabaya. *UNESA Journal of Chemical Education Vol. 1 No.1: 47-52*
- 6) Riduwan. 2010. *Skala Pengukuran Variabel-Variabel Penelitian*. Bandung: CV Alfabeta
- 7) Sadiman, Arief S, R. Rahardjo, Anung Haryono, Rahardjito. 2006. *Media Pendidikan : Pengertian, Pengembangan, dan Pemanfaatannya*. Jakarta: PT. Raja. Grafindo Persada.
- 8) Fenrich, Peter. 1997. *Practical Guidelines for Creating Instructional Media Applications*. USA: Harcourt Brace & Company.
- 9) Suyono dan Hariyanto. 2011. *Belajar dan Pembelajaran*. Bandung: PT Remaja Rosdakarya.
- 10) Johnson, David W and Johnson, Robert T. 1975. *Learning Together and Alone: Cooperation, Competition, and Individualization*. New jersey: Prentice Hall, inc.
- 11) Trianto. 2010. *Mendesain Model Pembelajaran Inovatif-Progresif: Konsep, Landasan, dan Implementasi Kurikulum Tingkat Satuan Pendidikan (KTSP)*. Jakarta: Prenada Media.
- 12) Hardiyanti, Eka Novia dan Lutfi, Achmad. 2013. Meningkatkan Hasil Belajar Siswa pada Pembelajaran Unsur dan Senyawa Kimia Sederhana dengan Menggunakan Media Permainan Tradisional Gobak Sodor. *UNESA Journal of Chemical Education Vol.2 No.2: 7-11*.