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## Activating Student to Learn Chemistry using *Chemmy Card* 6-1 Game as an Instructional Medium in IUPAC Nomenclature of Inorganic Compounds

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# Activating Student to Learn Chemistry using *Chemmy Card 6-1* Game as an Instructional Medium in IUPAC Nomenclature of Inorganic Compounds

**A Lutfi and R Hidayah**

Department of Chemistry, FMIPA, UNESA, Surabaya, Indonesia

Email: [achmadlutfi@unesa.ac.id](mailto:achmadlutfi@unesa.ac.id), [ruslyhidayah@unesa.ac.id](mailto:ruslyhidayah@unesa.ac.id)

**Abstract.** The aim of this study is to know the effect of Internet-assisted *Chemmy Card 6-1* game as an instructional medium in IUPAC Nomenclature of Inorganic Compounds material for X grade of senior high school on students' activity, learning motivation, and learning outcome. The study was conducted at SMA Negeri Sidoarjo, Indonesia, in two different classes. The instruction was done based on the lesson plan made. The observation on students' activity was conducted during the instruction with the game while test and questionnaire were given after the instruction. The result showed positive activities, which students listened to the teacher's explanation, actively delivered questions, and enabled to solve problems in naming compounds. It was also effective to avoid the drowsiness. The result of students' motivation of X MIPA 6 was 74.78% (good) while X MIPA 7 was 83.80% (very good). The pretest results of two classes showed that no students mastered but 100% students mastered and the increase of N-gain scores in two classes was categorized as high,  $\geq 0,7$ , after the instruction. The result of this study showed that the use of Internet-assisted *Chemmy Card 6-1* game in IUPAC nomenclature of inorganic compounds for X grade of senior high school could be pleasant for students to learn and effective in achieving the learning objective.

## 1. Introduction

The main thoughts in education in Indonesia are doing conscious and planned effort; creating learning atmosphere and learning process so that students actively develop their own potential; and having spiritual strength, self-control, personality, intelligence, noble character, as well as the necessary skills for himself, society, nation and State. This means the need to create an atmosphere of learning and learning process so that learners actively develop their potential, one of which is in Chemistry in senior high school.

Senior high school chemistry is perceived as very difficult for students to comprehend "the subject matter of chemistry at high school contains many concepts which is quite difficult to understand by students, because it involves chemical reactions and calculations, and involves concepts that are abstract and microscopic"[1]. Not only from the characteristics of chemistry lessons that are felt difficult, but also the collaboration between educators and learners is necessary so that communication that occurs in the learning process can take place properly. Sadiman [2] states that teaching and learning process is essentially a communication process. The occurrence of good communication in teaching and learning process needs a good message distributor as well which is called education media in education field.

Media are no longer only seen as mere tools for educators to teach, but more as a means of channeling messages from the messenger (educator) to recipient (learners). Based on the results of a study at SMA



Negeri in Sidoarjo on Chemistry class, students were not interested in Chemistry instruction because there were no instructional media used by teachers. The disinterest of students to learn can be influenced by the low students' learning motivation. According to Uno [3] learning motivation can arise due to intrinsic and extrinsic factors. (a.) The intrinsic factor, in the form of desire and the impulse of learning needs, hopes of aspiration. (b) Extrinsic factors are appreciation, a conducive learning environment, and interesting learning activities.

There is a correlation between students' achievement and students' learning motivation. The learning achievement of students with high learning motivation is greater than students with medium learning motivation. The learning achievement of students with medium learning motivation is better than low learning motivation [4]. To be able to improve students' achievement, educators must be able to motivate students to learn. Motivation that can be implanted to students is an extrinsic factor that can be created by an educator through a conducive learning environment and interesting activities so it is fun for students. One of the fun alternative media for students is game. Not only playing but playing while learning is fun for students in the learning process. Games surely give challenges that will motivate students to solve existing problems so as to create an active learning in the classroom. With the game students can be directed at the learning process in which students actively seek information so the knowledge scheme was formed in their minds [16]. Heinich states that the advantages of Internet in learning include media variations, access to the latest information, and low cost [5].

One effort to improve students' ability is by directing the learning process in which students actively build their own knowledge (the theory of constructivism). Two ways that are close to students are with game and the Internet. It is hoped that the combination of the game and Internet is able to construct knowledge independently to find the source of data or information sources. Games developed as instructional media can improve the learning outcomes of the medium category and students feel happy if the learning is conducted in the form of a game [6]. This is in line with Hardiyanti's study [7] that Traditional Games can fulfill the mastery of students' learning outcomes from 41.6% in pretest results to 91.67%. Therefore, game can be a solution to enable students to learn.

In preliminary study in several senior high schools in East Java, 57.14% of students stated that the IUPAC Nomenclature of Simple Inorganic Compounds as material that is difficult to learn, and not yet fulfill the mastery. One of the alternatives that can be used in the implementation of teaching and learning process on Nomenclature of Inorganic Compound Material is with Internet-assisted *Chemmy Card 6-1* game that has fulfilled the feasibility as an instructional medium [8]. *Chemmy Card 6-1* game consists of game cards, game guide, and Internet guide, 8.7 cm x 6.2 cm card size totaling 90 pieces that are categorized into 4 types of cards: ionic compound, molecular, acidic, and base. Each game card has three boxes on top and three boxes below containing the molecular formula of a compound that has similarities, that is, on the IUPAC nomenclature of the compound. In the center of the card there is the name of the IUPAC and one molecular formula of the compound that is in the 6 boxes above and below the card. Intertet is used to collect the necessary data, game is played with 2-3 students per group and the game ends when the time is up or the cards are up. *Chemmy Card 6-1* game is expected to be able to create an active and fun learning environment. With the encouragement of extrinsic motivation by educators, students are expected to grow intrinsic motivation on themselves so as to improve students' learning outcomes. Therefore, this study is to know the influence of *Chemmy Card 6-1* game use towards students' activity, students' learning motivation, and study result on IUPAC Nomenclature of Inorganic Compounds.

## 2. Method

The present study adopts "One-Group Pretest-Posttest" design, targeting science students of the tenth (X) grade 6 dan 7 at SMA Sidoarjo. The classes were selected to reinforce the findings of the study. This study is started with a pretest, followed by the media implementation of Internet-assisted *Chemmy Card 6-1* game, and finalized by a posttest, aiming to observe the students' learning achievement after using the Internet-assisted *Chemmy Card 6-1* game. On the other hand, during the learning process, another observation took place to investigate the students' activities. In addition to the posttest given at

the end of the learning process, a motivation questionnaire was distributed as well to record the students' responses to their learning motivation. The students' activities were observed in the groups within 5 minutes before calculating the percentage.

The data from the students' learning were analyzed by calculating the frequency of events occurred during the learning process.

$$\text{Percentage (\%)} = \frac{\text{frequency of occurrence that appears}}{\text{frequency of overall activity}} \times 100\% \quad (1)$$

A student would be labeled "pass" once his or her score achieved  $\geq 2,67$  (75). The data from the pretest and posttest were analyzed using the following formula

$$\text{Student scores} = \frac{\sum B}{N} \times 100 \quad (2)$$

where: B = Total correct responses

N = Number of items

The students' learning achievement was analyzed through gained scores. The data describing whether the students improved were calculated with the formula as follows.

$$G = \frac{S_{pretest} - S_{posttest}}{S_{max} - S_{pretest}} \quad (3)$$

Additionally, the percentage of the students' motivation was calculated with the following formula

$$\text{persentase} = \frac{\text{jumlah skor hasil pengumpulan data}}{\text{skor kriteria}} \times 100 \quad (4)$$

### 3. Findings and Discussion

The data of students' activities were obtained after doing observations every 5 minutes during 90 minutes of teaching. Table 1 displays the data of students' activities:

**Table 1.** Students' Activities

No	Activities	Frequency (%)	
		Grade X MIPA 6	Grade X MIPA 7
1	Listening to the information/explanation from the teacher	16,7	15,4
2	Following the game rules	17,8	18,4
3	Raising questions of something not yet understood	32,7	33,1
4	Participating in student-teacher discussion	32,7	33,1
5	Not following the learning process/ being involved in irrelevant activities/ being sleepy	0	0

The aforementioned result of activities that were observed using an activity sheet implies that during the learning process: the students could learn by playing the game, they participated actively in the class, the game encouraged student-student cooperation within the group, the students enthusiastically asked

questions and guessed their opponents' cards, and finally they searched the IUPAC nomenclature in seconds with the Internet assistance zealously. These indicate that the internet-assisted game worked well as an instructional medium to make the students learn actively.

The findings in the present study confirm those of a study by Rastegarpour and Marashi [9], that an in-class game has the potential to encourage student's active participation in learning and maintain it until the rest of the learning process. A game which is specially developed to be used as an instructional medium will increase student's desire to learn, make learning fun, as well as encourage student-student interactions [10].

The study yields the results from the pretest and posttest:

**Table 2.** Students' Learning Achievement

Class	Total students	Mastery	
		Pretest	Posttest
X MIPA 6	31	0	31
X MIPA 7	34	0	34

The pretest to students of X MIPA 6 indicates that 100% of the students failed to pass the minimum mastery criteria of 75, and that after using the game as the instructional media, 100% of the students could pass with the increase of the N-gain score of the two classes are categorized as high, that is  $\geq 0,7$ . Similarly, the pretest result of X MIPA 7 demonstrates that 100% of the students could not pass the criteria of 75, and that after learning with the game, 100% of the students made it. The two classes could successfully pass the criteria with the Internet-assisted game. The findings indicate that the use of computer-assisted game can help achieve the minimum learning criteria, and that the findings are in a line with those of previous studies which found that games could enhance learning achievement [11, 12]. More activities during the game are intended to train intelligence through sounds, pictures, linguistics, kinesthetic, and intrapersonal intelligence [13].

The students' motivation can be observed from the motivation questionnaire, and the result is as follows:

**Table 3.** Students' Motivation

Motivation	X MIPA 6	X MIPA 7
Mean	74.8 %	80.1 %

The result of students' motivation from the two different classes explain that the students of X MIPA 6 and MIPA 7 explain their good and very good motivation when learning using chemmy card game, thus the game is considered capable to motivate the students to learn IUPAC nomenclature of inorganic compounds. The particular finding conforms to the previous finding showing that using comics as science instrutional media is capable to motivate students [17]. Similarly, Inal & Cagiltay [14] suggest that computer-assisted games as instructional media can successfully motivate student's learning, give more learning experiences, and maintain the learning motivation. Inal & Cagiltay [14], even mistakes when playing can be an approach to self-reflection to reuse the playing strategy in order to improve the knowledge as well as motivate themselves to give another try [15]. In other words, it means that the Internet-assisted game can make students interested in learning chemistry and allow them to establish clear knowledge from ambiguities, from trial to new insights [16].

## 4. Conclusions and Suggestions

### 4.1. Conclusions

Conclusions can be drawn from the above discussion: Teaching IUPAC Nomenclature of Inorganic Compounds can adopt the Internet-assisted chemmy card 6-1 game in order to encourage active

participation, motivate students during the learning by playing process, and effectively achieve the learning objectives.

#### 4.2. Suggestions

It is further suggested that the Chemistry teachers integrate games available as instructional media to their classes to uplift students' active participation during the teaching and learning process.

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