



Students' understanding of plant classification using the PLANTA-FUN card game media



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ARTICLE INFO	ABSTRACT
<p>Article history Received April 10, 2021 Revised July 12, 2021 Accepted August 24, 2021</p> <p>Keyword: Profile understanding Stimulated understanding Symbol of meaning PLANTA-FUN card game</p>	<p>UNO card game-based learning media have been developed with various modifications. Therefore, there is a need for studies that describe the role and meaning of the symbols used in UNO card media on students' understanding. The purpose of this study is to describe the profile of students' understanding who were stimulated by symbols of meaning in the PLANTA-FUN card game media on plant classification material. The PLANTA-FUN card game media is a modification of the UNO card game created by combining the colors and images of the key-living creatures. This research was conducted using Mixed Method Research (quantitative-qualitative). Pre-test and post-test to determine students' understanding of classifying the plants. In addition, interviews were also conducted to evaluate students' understanding of the meaning of the symbols. Based on the pre-test and post-test results, the t-value (8.612) > the t-table (2.101). So it can be seen that there was an increase in students' understanding after learning using the PLANTA-FUN card game media. Based on the interview, symbols of meaning in the form of images and colors on the PLANTA-FUN card game media can help stimulate students to remember and think. The key character images of plants used in this media can naturally visualize plants so that students can quickly identify the characteristics that appear in these plants. At the same time, the color symbols that represent groups of living things can quickly stimulate students in recalling groups of plants. Combining these two symbols of meaning can improve students' understanding of plant classification learning material.</p>
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Introduction

Good learning environment conditions must support a learning process. One component of learning that must be met is

learning media (Arifin, 2016). Learning media is used as a means of interaction and communication between teachers and students and facilitating the delivery of

concepts; thus, teachers need to use learning media as much as possible (Chandra, 2011). Learning media in science learning can improve students' enthusiasm (Ghofur, 2018). Students can observe, hear, or feel to get some knowledge or skills (Umar, 2014). Therefore, teachers ought to choose the most appropriate media to be used so that the learning process can be more effective, enjoyable, and educative (Rohwati, 2012).

Teachers' creativity is needed to design a learning media (Mahnun, 2012). An appropriate learning media must be chosen based on the learning objectives, the characteristics of learning materials, and the characteristics of students. The material classification of living things must teach students to observe living things and describe their characteristics to group living things based on the traits they have (Prihartiningsih et al., 2016). According to Piaget, students aged 12-19 years reached the formal operations stage. At this stage, students can already think abstractly. Meanwhile, according to Robert Sternberg (as cited in Danim, 2014), students at this age possess experiential intelligence, which is intelligence in comparing old and new information. The skill requires learning media to activate cognitive skills (Ramchandran et al., 2020).

Based on the observations, students have difficulty understanding plant classification material. This is shown from the data that only 23% of students can achieve the KKM score of 75. Students generally have difficulty identifying the characteristics of plants, classifying them. Some plants have never been seen because they do not grow around the students' environment. In addition, students have difficulty remembering some terms such as Angiosperms, Gymnosperms, and others. The pictures used by teachers neither can motivate nor be effective for students to learn about plant classification.

Meanwhile, in Permendikbud No. 37 Tahun 2018, the students must achieve the basic competence of classifying living things and objects based on the observed characteristics (Kementerian Pendidikan dan Kebudayaan, 2018). Based on this competence, students must observe the characteristics of these living things and identify the characteristics of these living things, including plants. Therefore, learning media is needed to encourage

students to observe plant characteristics, identify characteristics, and classify them.

In order for the learning media to accommodate students to observe, images are used, and to assist students in remembering some terms in the classification of plants, symbols of meaning in the form of colors are used. According to Purnamasari et al. (2012), visual media in learning classification materials can actively involve students and attract students' interest and attention. One learning media that contains pictures and text is the UNO card. Various development of UNO cards as a learning medium has been carried out in several subjects, for example, the development of UNO cards on optical material (Estiani et al., 2015), UNO Mathematics card development (Rahmatin & Khabibah, 2016), development of UNO cards in bank material (Agustin, 2018), and the use of UNO card media on hydrocarbon compound material (Sari et al., 2018). The studies that have been conducted emphasize the effect of UNO card media on students' responses, learning outcomes, and students' character.

In this research, an analysis of UNO card media was developed, which was recreated into a PLANTA-FUN card game (Plant Taxonomy of Uno Card Game) card. The PLANTA-FUN card media game was developed by replacing the numbers contained in UNO cards in general into images. The image used is an image that shows the key characters of a plant. In addition, the PLANTA-FUN card game media also uses a variety of card base colors, namely red, yellow, green, and blue. These colors stimulate students to recognize characteristics and group living things. This research was conducted to determine the understanding profile of students who have been stimulated using meaning symbols in images and colors.

Method

This research was conducted at SMP Anak Terang Salatiga with all 7th grade students which are 19 students. This research was conducted with Mixed method research which combines quantitative methods and qualitative method (Creswell, 2013). Quantitative research was conducted to examine changes in student's understanding before and after the implementation of the

PLANTA-FUN card game media through pre-test and post-test results which were then tested using a SPSS (Paired Sample Test). The students were stimulated with images and color symbols on the PLANTA-FUN card game media. The qualitative research was carried out to describe the profile of student's understanding based on interviews with students.

PLANTA-FUN card game is a media card on plant classification that is designed using images and colors. This is a 6 cm x 9 cm media card and contains 152 cards consisting of 4 colors which are red, yellow, green and blue. The colors that use in this media have a meaning. The meaning of colors in the PLANTA-FUN card game media is presented in Table 1.

PLANTA-FUN card game media also consist of images. The image shown on the card is an image that shows the key character of a plant. The PLANTA-FUN card game media display is presented in Figure 1.

At the beginning of the lesson, a preliminary test (pre-test) was carried out

to determine the students' initial abilities. Then learning is done using the PLANTA-FUN card game media. In this game, students are divided into 2 groups of 9 and 10 people. Games are played individually. To start the game, each student is given 7 cards. The remaining cards are placed in the middle of the students. Player order can be clockwise or counter clockwise. The based rule of this game is to take out cards that have pictures of plants which have same characteristics or in the same group. When the player takes out a card with a picture of a plant, the player must state the structure of the plant and the group of plants. The winner in this game is the fastest to spend the cards they have. Then at the end of the lesson, a post test was carried out to measure students' understanding after the implementation of the PLANTA-FUN card game media. The teacher also conducts interviews to determine students' understanding in classifying plants stimulated by symbols of meaning.

Table 1. The meaning of color in the PLANTA-FUN card game media

Plant group	Card color	Characteristics	
		Reproduction	Parts of plant
Spore plants			
Moss (Bryophyta)	Green	Generative	Antheridium, Archegonium
Fern (Pteridophyta)	Blue	Vegetative	Spore
Seed plants			
Open seeded (Gymnospermae)	Red	Generative	Flowers, Seeds
Closed seeded (Angiospermae)	Yellow	Vegetative	Roots, Stems, Leaves



Figure 1. PLANTA-FUN card game media

Results and Discussion

Students' Preliminary test and Post test Result

The PLANTA-FUN card media game can help students understand the classification of plants. The paired sample t-test is shown in Table 2, t-value of 8.612 > the t-table 2.101. There are differences in cognitive learning outcomes between before and after implementing PLANTA-FUN card game media.

Based on the pre-test result, students do not yet understand the characteristics of plants, differentiate the characteristics of plants, and classifying plants. Learning process that only conducted with verbal and teacher centered is not effective for learning plant classification material. The teacher had to improve the learning process by using innovative learning media.

So, learning was carried out using the PLANTA-FUN card game media. It was found that there was an increase in students' understanding on classifying plants after using the PLANTA-FUN card. With this media, students can be actively involved in the learning process. Using visual media in the learning process can have a better impact than verbally only (Pajriah & Budiman, 2017).

There were two things that can improve students' understanding, image symbols and color symbols. From interviews is known that through image symbols, students can be encouraged to observe plants, identify plant characteristics, and classify the plants. Meanwhile, color symbols can stimulate students to recall plant groups and make it easier to determine the plant groups. The use of colors and images can increase student interest (Castillo et al., 2017). Besides that, it can also have a positive impact on students' attention and memory (Sujarwo & Oktaviana, 2017). So, it can support students to think and learn.

Profile of Students' Understanding of Image Symbolic Stimulation

The image symbol used in PLANTA-FUN card game Media is the image of a key characters of a plant, for example the number of flower crowns, leaf structure, roots shape, spores, etc. These key characters were chosen to focusing students on observing parts of plants that can be used as a basis for classifying the plants. The results showed that the use of image symbols in PLANTA-FUN card game media can help students observe the structure of plants and identify the characteristics of these plants. This statement is supported by the results of interviews with Subject 1 (Table 3).

The results of the interview, subject 1 experienced a thought process that was to observe and understand the characteristics of plants. Subject 1 coded the meaning of the root image represented by his statement "Because its roots (akare) are similar...". Akare is an Indonesian expression mixed with Javanese which means 'its root'. Subject 1 observed a picture card of corn root and then constructed the knowledge he already has so that he can understand that the corn root is a fibrous root. Then subject 1 looked at his card and searched for the card that best matches the card with the picture of a corn root. After making observations, subject 1 found that there was 1 picture on the card that had both a fibrous root which was a card showing a root of scallions, so subject 1 took out a card showing a scallion. This shows that the use of images on PLANTA-FUN card game media can stimulate students to process the information through observing activities, then combine it with the information they already have. So, they can identify the characteristics of the plants. The use of visual media in learning helps students to better understand a subject matter because students can see the subject matter tangibly (Jain & Billaiya, 2017).

Table 2. Pre-test and post-test results (Paired sample t-test)

		Paired Differences					T	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	POSTTEST - PRETEST	30.526	15.450	3.545	37.973	23.080	8.612	18	.000

Table 3. The results of interviews with subject 1

Researcher's question	Subject 1's answer
<p>“(Guru memberikan kartu bergambar akar daun bawang, bunga sepatu, daun pepaya, lumut tanduk, dan tanaman paku kepada peserta didik 1. Kemudian mengeluarkan gambar akar jagung). Kalau kartu terakhir yang dikeluarkan adalah kartu ini (menunjuk ke kartu bergambar akar jagung) dan giliran selanjutnya adalah kamu. Kira-kira kartu apa yang akan kamu keluarkan?” - “(The teacher gave picture cards of scallion roots, hibiscus flowers, papaya leaves, hornworts, and nail plants to student 1. Then gave a picture of a corn root). The last card taken out was this card (pointing to the corn root card) and next is your turn. What card would you take out?”</p> <p>“Mengapa kamu mengeluarkan kartu ini (kartu bergambar akar daun bawang)” - “Why did you take out this card (a card of a scallion root).”</p>	<p>“Ini (mengeluarkan kartu bergambar akar daun bawang)” - “This one (Pulled out a card with a picture of scallion roots)”</p> <p>“Karena akare mirip, ini serabut sama serabut” - “Because its roots are similar, they are both fibers”</p>

When the student take out the card, students are asked to mention the characteristics of the plants on the card. The other example, when the last card is a card with dicot plants. Then the student wants to take out a card with a picture of the Alamanda flower, then the student have to say that the picture is an image of a flower crown consisting of 5 crowns so that it can be classified as a dicotyledonous plant. Thus, students have to observe the characteristics of plants and not only see the color. Color in this media is used to help students to recall the name of the plant group. This statement is also supported by the results of interviews with Subject 2 (Table 4).

The results of the interview with subject 2 it can be seen that subject 2 also observed and identified plant characteristics. According to a research [Shabiralyani et al. \(2015\)](#), the use of visual media in classroom learning can stimulate students to think and create good learning conditions in the classroom. Subject 2

presented a picture with features such as grass as he said "... like grass, Miss".

The statement shows that the presentation of images in the form of key plant characters can focus students to observe certain characteristics of plants. Students will begin to build their thoughts based on the knowledge they have. Visual learning media can encourage students to connect learning with their daily lives ([Vadsariya, 2017](#)). Students who have previously understood the structure of parallel leaf bones of grass will compare the structure with other existing cards so that when the teacher takes out a card of pandan leaf with parallel leaves, then the student draws a card with a picture of a banana leaf which also has a parallel leaf structure. The interviews with the students show positive impact of using images on the PLANTA-FUN card game media. Image can visualize the structure parts of plants clearly and vividly so that it is able to stimulate students to easily observe the structure of plants.

Table 4. The results of interviews with subject 2

Researcher's question	Subject 2's answer
<p>“(Guru memberikan kartu bergambar daun pisang, bunga sawi, akar bawang, lumut tanduk, dan gametofit paku kepada subjek 2. Kemudian mengeluarkan gambar daun pandan). Kalau kartu terakhir yang dikeluarkan adalah kartu ini (menunjuk ke kartu bergambar daun pandan) dan giliran selanjutnya adalah kamu. Kira-kira kartu apa yang akan kamu keluarkan?” - “(Teacher gave the subject 2 picture cards of banana leaves, mustard, onion root, horn moss, and gametophyte nails. Then the teacher took out the pandan leaf image). If the last card drawn out was this card (pointing to a pandan leaf picture card) and next is your turn. What card would you take out?”</p> <p>“Mengapa kamu mengeluarkan kartu ini (kartu bergambar daun pisang)” - “Why did you take out this card (a banana leaf picture card)?”</p>	<p>“Berarti ini miss (mengeluarkan kartu bergambar daun pisang)” - “This one, Miss (taking out a card with a picture of a banana leaf)”</p> <p>“Ini tulang daunnya sejajar miss. Kayak daun kelapa, kayak rumput gitu kan miss.” - “Here, the leaf bones are aligned, Miss. Like coconut leaves, like grass, Miss.”</p>

The diverse plant images in the media of this card can also be a habit for students in observing and understanding various existing plant structures. When students are asked to analyze the structure of certain plants on the card, students will recall the structure of plants that have been studied and compare them with images of plants that must be analyzed from its structure. It makes students not only memorize the structure and plants' name, but also have skills to analyze the structure of various plant and connect them to existing theories. The use of key character can also focusing students to the one part of the plant that is able to represent the plant characteristic. According to the dual coding theory by Paivio, it is known that verbal and visual information will be proceed separately in the human memory system (Paivio, 2006). In this study will be selected in the image process by the student. Relevant information is selected and integrated with information that has been previously owned (Reynolds & Miller, 2003).

Profile of Students' Understanding of Color Symbolic Stimulation

In addition to symbols in the form of images, symbols are also used in the form of colors. Color can have a positive influence on students' memories so it can be used as a strategy in improving students' cognitive learning outcomes (Sujarwo & Oktaviana, 2017). Colors also have an impact on students' recalling process (Alyahya & Nasser, 2019). The colors used in the PLANTA-FUN card game media illustrate the characteristics of plants that can stimulate students to remember and construct their knowledge more easily. The meaning of color on PLANTA-FUN card game media is shown in Table 2.

The use of color in the PLANTA-FUN card media game can make it easier for students to recognize groups of plants. There are several things that make color symbols can make easier for students to understand plant classification. The first is "color is a simple symbol", so it can be easy to observe and understand by students. According to students, color is a symbol that is more easily observed as expressed by subject 3 (Table 5).

Based on the interview results (Table 5), it is known that color is a symbol that is

considered easily understood by students, thus color can be integrated with certain meanings. The colors that are implemented in learning can affect the performance of students in performing cognitive tasks (Brooker & Franklin, 2016). Color can also affect students psychologically which are related to emotions, attention, and memory (Dzul kifli & Mustafar, 2013). Color can improve students' short term memory (Sujarwo & Oktaviana, 2017). At the beginning of the lesson, the teacher explains the meaning of each color available from the cards. It is aims to give a stimulation to students and also to introduce the meaning of the colors used in the PLANTA-FUN card game. When students want to name a group of plants, they can see the color of the card and remember the group of plants based on that color. Subject 3 defined color as the identification of the characteristics that are most easily observed, this is reflected in the statement, "Because it's the easiest". This expression indicates that the color identity on this learning media card is a marker that is quickly found by the subject. Therefore, subject 3 decided to draw out the same card as the previous card which was also red.

Table 5 indicate the answer from Subject 3. From the results of the interview it is also noted that subject 3 remembered that the red color represents a group of seeded plants. Subject 3 began to think whether the plant is an open seeded plant, closed seeded plant, monocot or dicot plants. For this reason, subject 3 analyzed the picture on the card, which was a frangipani plant with 5 flower crowns. Then, subject 3 compiled information that has been obtained then concluded that seeded with 5 flower crowns are dicotyledonous plants. This is evident from the statement, "Because... (thinking) they're both red. It has the same number of 5 crowns. So, they're both dicot". This shows that the color can be used as a stimulus to stimulate students in developing their thinking from remembering the names of plant groups to being able to classify plants correctly.

The statement of subject 3 is also supported by the following statement by subject 2 which stated "... Then if I look at the colors, Miss ... I remember what the plants are."

Table 5. The results of interviews with subject 3

Researcher's question	Subject 3's answer
<p>"(Guru memberikan kartu bergambar batang bambu, bunga kamboja, pinus, lumut hati, dan paku sarang burung kepada subjek 3. Kemudian mengeluarkan gambar bunga sepatu). Kalau kartu terakhir yang dikeluarkan adalah kartu ini (menunjuk ke kartu bergambar bunga sepatu) dan giliran selanjutnya adalah kamu. Kira-kira kartu apa yang akan kamu keluarkan?" - "(The teacher gave the subject pictures of bamboo sticks, frangipani flowers, pine, liverworts, and bird's nest fern to subject 3. Then took out a picture of a hibiscus). If the last card drawn out was this card (pointing to the hibiscus card) and next is your turn. What card would you take out?"</p> <p>"Mengapa kamu mengeluarkan kartu ini (kartu bergambar bunga kamboja)." - "Why did you take out this card (frangipani flower card)?"</p> <p>"Berarti kamu lihat warnanya dulu?" - "So you see the color first?"</p> <p>"Kenapa kok lihat warnanya dulu?" - "Why do you see the color first?"</p>	<p>"Ini (kartu bergambar bunga kamboja)" - "This one (frangipani flower card)"</p> <p>"Karena... (berpikir) sama-sama merah. Sama kan mahkotanya 5. Jadi, sama-sama dikotil." - "Because... (thinking) they're both red. It has the same number of 5 crowns. So, they're both dicot."</p> <p>"iya." - "yes."</p> <p>"Soalnya yang paling gampang." - "Because it's the easiest."</p>

The statement of subject 2 on the Table 6 indicate that images can visualize the structure of plant parts, while color can build students' thinking based on knowledge of the plant structure that is already owned and the stimulus from the teacher who represents the group of plants into color. A learning process have to activate students to build the knowledge (Trisdiono, 2015). According to Vygotsky, a child will actively construct his knowledge. This is supported by the idea of Zone of Proximal Development and Scaffolding which states that students need the guidance of more skilled people to complete tasks (Slavin, 2011).

Besides that, from the results of interviews with subjects 2 and 3 it can be

seen that there are students who observed colors first and then the pictures (subject 3), but there are also students who observed the images first and then the colors (subject 2). It depends on the student's understanding level. If students already have a good understanding of the characteristics and classification of plants, students will look at the picture first and to make sure the group of the plants, they will see the color of the card. While on the contrary, if students have not yet understand the material, students will see the color of the cards first and then try to analyze the existing images. This is also expressed by subject 4 (Table 7).

Table 6. The results of interviews with subject 2

Researcher's question	Subject 2's answer
<p>"Setelah bermain kartu ini apakah kamu menjadi lebih memahami materi yang diajarkan?" - "After playing this card, are you more familiar with the material being taught?"</p> <p>"Apakah kamu mengalami kendala saat menggunakan kartu PLANTA-FUN Card Game ini?" - "Did you face any problems when using this PLANTA-FUN Card Game?"</p>	<p>"Ya kayak jadi bikin inget gitu lho miss, dikotil monokotil. Waktu lihat gambarnya jadi tahu tumbuhannya kayak gimana. Terus kalau lihat warnanya kan miss waktu itu apa... 2 warna itu sama jenis ya. Kan ada 4 warna kan miss. Kan miss waktu itu 2 ini sama (menunjuk kartu kuning dan merah). Jadi inget itu tumbuhan apa." - "Yes, it makes me remember more, Miss, dicot, monocot. When I look at the picture, I know the plants. Then if I look at the colors, Miss ... The two colors are the same type. There are 4 colors, miss. Miss at that time said the same 2 (pointing to the yellow and red cards). So I remember what the plants are."</p> <p>"Waktu itu saya terbalik antara melengkung sama menyirip miss." - "At that time I got curved and pinnate mixed up, Miss."</p>

Table 7. The results of interviews with subject 4

Researcher's question	Subject 4's answer
<p>"Ketika kamu ingin mengeluarkan kartu apa yang pertama kali kamu lihat dari kartu ini? Gambarnya terlebih dahulu atau warnanya?" - "When you want to draw out a card, what do you first see from this card? The image or the color?"</p> <p>"Setelah bermain kartu ini apakah kamu menjadi lebih memahami materi yang diajarkan?" - "After playing this card, are you more familiar with the material being taught?"</p> <p>"Apa yang membuat kamu bingung?" - "What makes you confused?"</p>	<p>"Warnanya dulu baru lihat gambarnya. Soalnya warnanya lebih gampang diamati jadi bisa lebih gampang ngamati gambarnya." - "The color first then the image. Because the color is easier to observe so it can be easier to observe the image."</p> <p>"Ya, lumayan. Ya ada yang masih bingung." - "Yes, kind of. I'm still confused about some parts."</p> <p>"ya nama-namanya, istilahnya. Terus kalau yang mirip-mirip tu bingung. Misalnya kayak bentuk daun kan kayak mirip gitu." - "Well, the names, the terms. Then if something looks similar, it's confusing. For example, the shape of the leaves are similar."</p>

The study results shown that students' decision to observe the card color first or the image first didn't have a negative impact because students can still observe the structure of plants and could be helped to classifying plants. Through the application of PLANTA-FUN card game media, there are a number of students who experienced difficulties in understanding the characteristics of a plant as expressed by subject 2. Table 6 indicate student's learning difficulties on plant characteristics.

The difficulty faced by subject 2 is due to the clearless images of the leaf bones. This makes it difficult for students to observe the image. Therefore, a clearer picture of plant parts is needed for the further research. Other difficulties were also experienced by subject 4. Table 7 represents excerpts of the interview transcript from subject 4.

Both of the students above conveyed the same thing, namely students have difficulty in recognizing the characteristics of plants because they are considered similar. Subject 2 conveyed the constraints faced through statements "At that time I got curved and pinnate mixed up, Miss". This statement is clarified by subject 4 which stated "...then if something looks similar, it's confusing. For example, the shape of the leaves are similar." From the statements of the two subjects, it can be suggested for further study on whether or not the addition of symbols of other meanings is needed to stimulate students' memories of various plant structures such as the form of leaves structure, stems, roots, flowers, spores, and so on.

From the results of the study, there are 2 symbols of meaning identified that can improve students' understanding, namely

the symbol of images and colors. The key character images of plants are able to visualize the characteristics of a plant clearly and vividly so that it is able to encourage and focus students to observe certain characteristics of plants more easily. While color is a symbol that is easily and quickly found so when colors are designed to represent the names of plant groups, it was able to stimulate students in remembering the names of plant groups. The combination of these two symbols of meaning encourages students to think and construct information already possessed with information obtained through the PLANTA - FUN Card Game media. Through image symbols, students can observe the structure of plants clearly and if students forget the name of the plant group, they can see the color of the card and recall the name of the plant group in question.

Conclusion

Based on the results of the study, it can be concluded that the PLANTA-FUN Card Game media can improve students' understanding in classifying plants that are shown based on the preliminary test and post test result. This improvement is supported by the use of 2 symbols in the Planta fun card game, image and color symbols. the symbol of meaning in the form of images encourages students to find features in observing plant structure, while the symbol of meaning in the form of color can be used to stimulate students quickly in recalling the names of plant groups so as to enhance students' understanding of plant classification material. These two symbols of meaning can have a positive influence on students' understanding ranging from observing,

identifying characteristics to being able to classify plants. The implications of the results of this study suggest that the affixing of images and colors to learning media needs to be taken into account based on students' thinking processes and also practical considerations in helping students accelerate in discovering the key characteristics of learning material. The next step can be studied further to determine whether or not additional symbols are needed to make it easier for students to identify the structure of plants.

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