Educational motion graphic “WINDMILL, THEN AND NOW”

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Abstract. The paper explored a planning of animation film which educated people about green energy. The research discussed Satrina Anggasta’s animated film. She is a student form Animation Program, Visual Communication Design Department, Bina Nusantara University. It was an artistic piece of video with simple style of design. The visual style of the film was a combination between 2D and 3D animation assets. A a qualitative analysis method based on interview from experts and book literature was applied to create a piece of information video that can entertain target audience. The result presents a movie describing a brief information about windmill that has been used a long time ago until now and how the windmill is changing from time to time using modern technology, to help people achieve better energy.

Keywords: educational film, motion graphic film, green energy

1. Introduction
The wind is one of the natural phenomena formed by differences in air pressure. The air moves from high pressure area to a place that has lower air pressure. This moving air has potential energy that can be utilized by humans to create energy. Human tries to use the wind as an energy source have been carried out since ancient times, for example when the wind is used to drive ships and boats. Then, wind energy is used by humans as a source of energy to grind wheat (rice) and to create water pump. Nowadays, wind energy is widely used as an energy source for electricity generation. During the change in power from this simple and heavy equipment to today's sophisticated and efficient machines, the technology used various stages of development.

The tool used to convert wind into useful energy is known as windmills. Although the technology now applied by windmills or wind turbines to produce electrical energy is much more modern, but the concept behind the machine has been applied for centuries. The windmill is equipped with a propeller (propeller blade) which is arranged in a circle centred at a point with the slope angle of the blade arranged so that when the wind moves through the propeller the rotor will rotate.

In the project, the researchers create a video describing a development of the windmill function from a simple to a high-tech machine that can supply people's electricity needs. The project uses the method of educational animation (e-learning) to help information delivered effectively in a fun way.

2. Methodology
The research uses qualitative research methods. According to Bogdan and Taylor in Moleong [1] qualitative research is a research that produces descriptive data in the form of words or spoken from
people and observed behaviour. Qualitative methods can describe the structural needs and desires of the audience, so they can see the need to gain enthusiasm from the audience. There is also an interview.

3. Discussions
The wind is the air that moves due to the rotation of the earth and the difference in air pressure around it. The heated air will expand which eventually rises because the particle becomes lighter. If the heated air rises, the air pressure decreases because the air decreases and cold air will flow to the low pressure place. The air then shrinks to be heavier and drops to the ground. On the ground the air became hot again and rise again. The flow of hot air rising and falling cold air is called convection.

There are four factors causing wind, including:

- **Barometric gradient**
  The number that shows the difference in air pressure of the two isobars which is 111 km away. The bigger the barometric gradient, the faster the wind blows.

- **Location**
  The speed of the wind near the equator is faster than winds that are far from the equator.

- **High location**
  The higher the location, the stronger the wind will blow. This is caused by the influence of the frictional force which inhibits the rate of air. On the surface of the earth, mountains, trees and other uneven topography provide great friction forces. The higher a place, the smaller the frictional force.

- **Time**
  The wind moves faster during the day and vice versa at night. Actually what people see when the wind blows light particles like dust carried with the wind. People can feel the wind because they have a sense of taste, which is the skin.

3.1. Windmill
The concept of utilizing wind energy is believed come from eastern countries, like India, Tibet, Afghanistan, and Persia. Even so, there's no ancient text that clearly explains the invention of windmills at that point. One among the primary windmill concepts is formulated by an Ancient Greek Engineer referred to as Heron (Hero) of Alexandria within the 1st century, through a monograph by Marie Boas entitled "Hero's Pneumatica - A Study of its Transmission and Influence," published in 1949 [2]. Pneumatica described during this book is understood as a source of reaction steam turbines, consisting of varied skilled tools that operate supported air or water, as shown in Figure 1.
Figure 1. A tool similar to a windmill, described by Heron in the book Pneumatica (a) Dutch-style rotor with four shafts that pump air [Woodcroft 1851]. (b) A device with a rotor watermill type [Schmidt 1899]. (c) a sketch of the Heron drive, according to Schmidt [1899].

Source: http://en.wikipedia.org/wiki/File:Heron%27s_Windwheel.jpg

3.2. The era of electricity generator

The era of electricity generator began within the late 1900s. The primary modern windmill specifically designed as an electrical energy generator was inbuilt in Denmark in 1890, referred to as a turbine. This contemporary turbine featured a much leaner posture. This is often because, unlike the traditional windmills, modern wind turbines usually do not drive machines that are placed in building windmills. Turbines supply electricity to rural areas within the same period, an outsized turbine generating electricity had a 17m rotor inbuilt in Cleveland, Ohio. For the primary time, the gearbox raised rotation was used on the planning, as described in Figure 2.

Figure 2. Fortis Alize 12 KW MAX 7.1m. Source: http://www.magnet4less.com/popup_image.php?pID=779I=0

Technological developments within the last 20 years have resulted in wind turbines that are modular and simply installed. Today a contemporary turbine is 100 times more powerful than a turbine 20 years
ago and wind farms now provide large amounts of power like conventional power plants. At the start of 2004, global wind generation installations have reached 40,300 MW so that the facility generated is sufficient to satisfy the requirements of around 19 million medium-sized households in Europe, which is like on the brink of 47 million people. Over the past few years the installation of wind turbine capacity has increased by more than 30%. This makes the target to produce wind power which is able to meet the world's energy needs up to 12% by 2020 to be realistic. At the same time, it will also reduce CO$_2$ emissions by 10,700 million tons [3].

The positive impact of the rise in average turbine capacity, one among which, in 2020 the value of the regional wind generation plant that supports will decrease to 2.45 cents / KWh, 36 percent cheaper than the value in 2003 which reached 3.79 euros / KWh. Nowadays windmill is additionally proven to make better ecosystem within the farming areas.

### 3.3. Animation

Animation may be a piece of film that came from the continual processing of a several numbers of images in order that the image looks moving and alive. Since past, humans have tried to form an animated motion pictures of their animals, like those found by archaeologists within the cave of Lascaux in Northern Spain, quite two hundred thousand years old. They struggled to capture the fast motion of running animals, like bison and horse, which were depicted with eight legs in several positions and stacked. When animation began to develop round the 18th century in America, J. Stuart Blackton was the primary person to introduce this system in his film titled Fun during a Bakery Shop that uses clay. This film was perhaps a stop motion animation film that first appeared in 1902. Because on the opposite hand, within the same year in Europe, a computer graphics pioneer named George Melies, a French filmmaker also created an animated film with an equivalent technique, it's just that the film is a smaller amount exposed. The film, entitled A visit to the Moon, lasts 14 minutes if projected at 16 frames per second, which was that the standard frame rate at the time the film was made. Additionally, to prevent motion, there were several other techniques or tools for creating simple animations at that point, including phenakistoscope, zoetrope, flip book, and praxinoscope theatre.

Furthermore, after technology starting began to develop, shooting up animation created with technology. Computer animation is the art of manufacturing moving images through computer use and is a component of the sector of special effects and animation. More animation is generated through 3D special effects, although 2D special effects are still widely available. In 2D animation, animated figures are created and edited on a computer using 2D bitmap graphics or 2D vector graphics. While 3D is even more complex because it adds a spread of effects in it like lighting effects, water and fire, and so on.

Learning to use animation has many benefits and advantages, including:

- Submission of material are often uniformed. Each teacher may have a special interpretation of a specific material concept. With the assistance of the media, such diverse interpretations are often avoided. Every student who sees or hears an outline of a cloth through an equivalent media, will receive precisely the same information as received by other students. Thus, the media can reduce the knowledge gap between students wherever they’re.
- The training process becomes clearer and more interesting, the media can display information through sound, images, movements and color, both naturally and manipulated. the topic matter, which is packaged through a media program, are going to be clearer, more complete, and attract the participants’ interest. With the media, presentation material can arouse students’ curiosity and stimulate students to react both physically and emotionally.
- Efficiency in time and energy with the media, learning goals are going to be more easily achieved to the utmost with minimal time and energy. the fabric doesn't need to be explained repeatedly by the teacher or tutor, because only with one presentation using the media, students will more easily understand the lesson.
- Improve the standard of learning outcomes the utilization of media not only makes the training process more efficient, but also helps students absorb the topic deeper. Only by taking note of verbal
information, students might not understand the lesson well. But if it's enriched with the activity of seeing oneself through the media, then understanding are going to be better.

- The training process are often done anywhere and anytime. Media learning are often designed in order that learning activities are often done more freely, anytime and anywhere, without counting on the presence of an educator or tutor.
- Foster a positive attitude towards the fabric and learning process with the media, the training process becomes more interesting in order that it encourages students to like science and likes to seek out their own sources of data.

3.4. Interviews
To support the making of this educational animated film, the writer conducted a survey through the website www.surveymonkey.com which was filled by 17 respondents aged 20-25 years. Based on the survey, the authors draw the conclusion that learning from books boring. So the alternative is learning through more interesting media, such as animated film media. As many as 81.25% prefer 3D animation. Stories and visual images are the main concern that makes people like an animated work. In addition, 100% of respondents already know what a windmill is, but many still do not know how to work a windmill and its benefits.

3.5. Visual Style
For this e-learning author using techniques, called hybrid or combination between 3D and 2D. The film will also use the new simplicity visual style which has the concept of summarizing something simpler [4]. Inversely related to complex things, simplicity seeks to minimize information as dense and accurate as possible so that the audience receives quickly, as presented in Figure 3.

![Figure 3. New simplicity](http://www.designboom.com/)

3.6. Color
For this project, we are using a special colour scheme that will compliment simplicity design, because the environment will use a lot of white color so we also need a little bit vivid colors that fit the technology theme. Eko Nugroho was saying, each color has properties that are able to represent the character of the used product [5]. It can be concluded in theory by using vivid colors provides an interactive effect to be more modern and hi-tech, it provides semiotic to the movement of the animation film. Figure 4 shows colors that the author references.
3.7. **Synopsis**

Wind energy has been known and utilized by humans. Since the 7th century, people living in the border regions of Afghanistan and Iran have been using wind energy to turn their windmills. Windmill, known as Persian Windmill, then began to be well developed, especially in mainland northwest Europe. Windmill is then used for various purposes. For example, Paltrokmill, a windmill specifically developed as a wood cutting tool. Whereas in this modern era the use of windmills is more as an environmentally friendly power plant.

Because the function of the windmill which for two centuries continues to change and develop, the author explains its development as well as discusses a little bit about the simple work system of the windmill so that it can be useful to help everyday human activities that will be summarized into an educational animated film. This film will discuss about the development of windmill technology that is increasingly developing, as well as its functions that change from mechanical energy machines to electrical energy machines.

3.8. **Asset visualization**

The choice of asset shape is adapted to the original shape of the object, and is made like a small miniature with the concept of new simplicity, shown in Figure 5.
Figure 5. Video assets
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