Worked example using S-Note application in carbon cycle study

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Abstract. The carbon cycle is the way in which carbon atoms, in various compounds, circulate through nature. The S-Note application has a handwriting mode feature that can be used in drawing object. Worked example are study approaches that provide step by step solutions for solving problems in a study. Worked example can reduce intrinsic cognitive load and germane cognitive load. The purpose of this study is to obtain information about worked example using the S-Note application in carbon cycle study. This research method is descriptive. The S-Note application is used in making carbon cycle images. The carbon cycle drawing consists of nine steps. The results of carbon cycle images are images that have JPEG format. The results show that worked example using the S-Note application can help study carbon cycles and show low categorization for intrinsic cognitive load, and very low categorization for germane cognitive load. Conclusion worked example using the S-Note application can reduce intrinsic cognitive load and germane cognitive load in carbon cycle study.

1. Introduction

In the biogeochemical cycle consists of carbon, water, nitrogen, sulfur, and phosphate cycles. The carbon cycle is one of the cycles found on this earth. The carbon cycle is the way in which carbon atoms, in various compounds, circulate through nature [1]. The carbon cycle is the most basic cycle of all material cycles [2]. Understanding the relevant carbon cycle can prevent increases in carbon dioxide concentrations in the atmosphere, which are the main cause of global warming [3,4]. The carbon cycle is in the ecosystem. Ecosystem is a system in which there is a relationship (interaction) interdependence between the components in it, both living and non-living [5]. The carbon cycle further represents the principle in the ecosystem of the material cycle.

In a carbon cycle study, media is needed to understand the process that occurs. One suitable media is image media. Image media can be created through the drawing application. The S-Note application is an application that is owned by Samsung products found on smartphones. Samsung applications can be an alternative tool for helping work. With the advancement of smartphone technology and the provision of a pen in this device, the Samsung application can be used by users [6]. In general, the S-Note application from Samsung is used in making notes, but in the S-Note application there is a handwriting mode feature. The handwriting mode feature can be used in drawing an object. Besides
being on a Samsung smartphone, the S-Note application can be used on a personal computer (PC) desktop. In the S-Note application there are tools used in making carbon cycle images.

Besides the carbon cycle images needed in the carbon cycle study, this study uses a worked example. Worked example are study approaches that provide step by step solutions for solving a problem in a study [7]. The influence of worked example has been extensively investigated within the framework of cognitive load theory. Cognitive load theory researchers have used arguments based on working memory load. The use of worked example comes from the cognitive load theory proposed by [8]. Worked example can improve the study of a concept and then it will be transferred to a different concept, it can reduce the cognitive load in the respondent’s working memory [9]. The process of processing information is influenced by the interpretation of the stimulus provided. The stimulus factor can be in the form of message design characteristics such as size, illustration, text, animation, narration, color, music, and video.

Worked example provide clues to reducing the intrinsic cognitive load [10]. Intrinsic cognitive load is a burden in processing information received. Intrinsic cognitive load is closely related to intrinsic processing in working memory when constructing cognitive schemes [11]. Worked example can also reduce germane cognitive load [12]. Germaine cognitive load is an important burden on study activities. This burden is also called an effective burden because the burden generated is a burden to form cognitive schemes such as creating knowledge structures and linking with the knowledge that is already owned by the respondent. By managing your intrinsic cognitive load well, it will produce a good germane cognitive load as well. The purpose of this study is to obtain information about worked example using the S-Note application in carbon cycle study.

2. Methods

This research method uses a descriptive method that aims to get a picture of worked example using the S-Note application in the carbon cycle study. This study uses the S-Note application from Samsung Korean manufacturer. The S-Note application is used in making carbon cycle images. The results of carbon cycle images are images that have a JPEG format. In addition to the S-Note application used on Samsung smartphones, this application can be used on a PC desktop (personal computer) on a Windows 7 operating system. The sequence of making carbon cycle images in the S-Note application is the first to create a new note file. The second choose handwritten mode. The use of handwriting mode on Samsung smartphones using the S-pen that has been provided. The third, select the stationery you want to use. Stationery in this application consists of pens, calligraphy pens, pencils, stables, and calligraphy brushes. In this study researchers used a pen. Fourth choose the color according to the object image in the carbon cycle. Fifthly design the background. Sixth is designing abiotic and biotic components in the carbon cycle. Seventh design direction and information arrows, eighth determine the color by the carbon cycle. The nine results of carbon cycle images in the S-Note application are saved with files in the form of JPEG images. In the carbon cycle study, the researchers used worked example to measure intrinsic cognitive load and germane cognitive load. Intrinsic cognitive load is obtained through the results of the task complexity worksheet adapted from [13]. Germaine cognitive load is obtained through post-test results related to the framework of [14].

3. Result and discussion

This research produces a product in the form of images that can be used by the wide community. The results of using the S-Note application in the form of 2D images with JPEG file format contained color, direction of the arrow as instructions and information. Carbon cycle images that are done with the S-Note application using a PC (personal computer) can be obtained dimensions 1280 x 905 with a size of 170 KB. With this scale the results of a good carbon cycle picture. In a carbon cycle study, an interesting picture is needed, so that the respondent can understand the picture presented. The use of color is important because it can facilitate respondents in distinguishing each component in the picture. The design of abiotic and biotic components influences respondents' understanding. Then the
direction of the arrow and the information in the picture as a sequence of processes in the carbon cycle study. The font size and font type used in carbon cycle images must be adjusted.

![Carbon Cycle Diagram](image)

**Figure 1.** Result carbon cycle picture using S-Note application.

In the carbon cycle study, researchers used worked example. Worked example are study approaches that provide step by step solutions for solving a problem in a study [7]. Respondents must understand the cycle drawing that has been created using the S-Note application. The results of the respondents obtained a total score of carbon cycle studies in the form of the ability to process and analyze information from a 72.00 task complexity worksheet that can be categorized as high. Intrinsic cognitive load is closely related to intrinsic processing in working memory when constructing cognitive schemes [11]. The score results indicate low intrinsic cognitive load respondents. Then the results of the respondents obtained a total study score of carbon cycles from 88.06 post-test which can be categorized very high. The results of these scores indicate that the germane cognitive load respondent is very low.

4. Conclusion
This study can be concluded that the S-Note application can be used to help study the carbon cycle. The results of the carbon cycle picture from the S-Note application can be as learning media. The results of the carbon cycle study using a worked example can reduce intrinsic cognitive load and germane cognitive load.

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