Retraction

Retraction: The Application of Innovation Visual Animation Media (VAM) at Electrical in Automotive Vocational Education (J. Phys.: Conf. Ser. 2111 012007)

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This article has been retracted by IOP Publishing following an admission by the authors that this article contains significant similarities with another published paper [1].

IOP Publishing has investigated in line with the COPE guidelines, and agree that this article should be retracted.

The authors have not commented on whether they agree or disagree with the retraction notice.

[1] Nurtanto M, Widjanarko D, Sofyan H, Rabiman, Bruni Triyono M, 2019, Learning By Creating: Transforming Automotive Electrical Textual Material Into Visual Animation As A Creative Learning Products (CLP), IJSTR 8 10

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The Application of Innovation Visual Animation Media (VAM) at Electrical in Automotive Vocational Education

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Abstract. The purpose of this study is to apply the concept of learning to electricity in the automotive sector based on visual animation media (VAM) as a creative learning product and to assess learning products. One shot case study was chosen as the research design. A total of 25 participants were involved in the VAM evaluation. Data collection uses product assessment sheets based on creativity, appearance, and product content validity. The results showed that it consisted of three important aspects, namely "mastery" of learning materials, "creative", and "artistic". Product creativity as an output is categorized as creative enough, the product display is quite good, and 64% of the products meet the content validity requirements, while 36% do not meet the exact criteria.

Keywords: Visual animation media, automotive vocational, innovation learning

1. Introduction
Nowadays, advancement of information and communication technology (ICT) has changed the way of knowledge transfer, particularly in the field of education [1]. Knowledge transfer has become easier with the integration of the three essential elements of the technology, particularly in the implementation into the learning process: namely, the technology-based learning, the integration of technology into learning, and environment [2]. Incorporation of these elements and the use of ICT could facilitate students' learning [3], while computers and its software can help teachers to do their tasks creatively, to support student learning [4].

Students who can utilize technology in learning can balance between the demands of work and learning [5]. It certainly strengthens the students' competence. Competence is defined as the knowledge, skills and abilities related to performance in carrying out the work [6]. Competence is also an underlying characteristic of a person associated with superior performance in the job [7]. Competencies required by the students during the learning process using the technology according to are the ability to manage e-learning by integrating a variety of software applications to create products and interaction with the learning content through the presentation of information in various formats (video, audio, animation, etc.).

Many teachers in vocational education institutions have been less concern on the attractiveness aspect of learning materials. The attractive design of the learning materials is possible to achieve,
especially in the development of computer technology, using computer-based media, [8]. The quality of teaching, the way teachers teach, teacher education, and the performance of teachers during the teaching are important factors that affect students’ achievement [9], because teaching is a collaborative learning process from various learning experiences, open-minded, open – hearted, teachers do not always become the centre of the learning process, and allows students play an active role, [10], [11].

Nurturing good teachers who are competent and able to provide interesting learning process, teacher education must be able to provide professional competence and capable of carrying out an interesting learning session with students. Teacher education must facilitate technology as an important tool for learning process. Consequently, teacher education program has the most influence on the implementation of the technology integration in education. With the benefits of the use of technology in the learning process, then the technology should be included in the learning environment [12], which emphasizes on problem solving [13]. The approach and strategy of technology integration in teacher education are very important in the practice of learning. Teacher education institution must implement digital learning context for learning more effectively and students get interactive learning experience [14].

Teaching quality determines the quality of education. Quality education starts from high quality teachers. The quality of teachers, attitude, dedication to the teaching profession, educational qualification, and professional training play an important role in modern education. Therefore, the teacher's role has paramount importance in generating enthusiasm and inspire students to learn, develop a person's intelligence and wisdom. Professional competence refers to the knowledge, skills, attitudes, capacity, and confidence to succeed in the profession and work. Teachers’ professional competence includes a wide range of competencies in different fields such as pedagogical, cultural, communication, personality, and professional needed for effective learning.

Automotive Engineering Vocational Education Program is a program which prepares candidates for vocational education teachers in the field of Automotive Engineering. Based on the study, one of the problems encountered in automotive electrical system learning process is that students have difficulty in understanding automotive electrical circuits and how the system works. One of the solutions is the learning process of automotive electrical system learning material through creative learning activities by transforming the textual material into creative visual products in the form of animation. In addition, while learning textual material, students are required to transform a textual product into the visual one and put it in the animation on the material being studied. In this study, the creativity of students is required to transform textual information into visual information which is more easily understood. Consequently, this requires creative thinking.

In this article, the invention was directed at developing ideas based on textual knowledge on automotive electrical system books. The ideas were then applied into visual concepts and manifested in a simple animation product. Animation was aimed at facilitating an understanding of the abstract concept of automotive electrical system into easily understood information through easily observed visualization or animation. According to Lowe and Schnotz [15], animation has become an important feature in technology-based learning. The rapid development of animation application in education is progressive with the advancement of information and communication technology.

Animation is the fast display of a static image sequence creating the illusion of motion to mimic the real motion. The practical feasibility of the animation use for learning process depends on the formulation and use of technology [16]. Therefore, the animation develops rapidly in the field of education. Creating a simple animation can be conducted in several stages, namely: making personal notes, character recognition, gaining inspiration, developing ideas, writing scripts, production planning, research/analysis, designing, creating storyboards, and creating. Animation is widely applied to increase interest and motivation, direct attention, illustrate the procedure, and explain how things work [15]. This study was aimed at (a) applying the concept of learning by creating by transforming textual learning materials into visual animation as a creative learning product, and (b) assessing product of the learning process based on the creativity, appearance of products, and the content validity of the product.
2. Research Methodology

A case study was implemented, involved 25 participants who underwent treatment, and further were assessed based on the products produced during learning process. The learning process was conducted using the concept of learning by creating through transforming the textual learning materials into visual material in the form of animation, as a creative learning product. The product was assessed based on the creativity, appearance, and the content validity.

The learning process was carried out with reference to the following guidelines: (a) the use of the technology during learning process to manage e-learning by integrating a variety of software applications to create a product and interaction with the learning material content through the presentation of information in various formats, in this case the animation; (b) the generative learning process of transforming textual learning material into something new in graphic form [17]; (c) the learning process was carried out by the productive process [18] through creative learning process to encourage students to find new ideas and products, be initiative, find relevant information allocating sufficient time (2 weeks) to transform the textual learning material (automotive electrical system) into a visual concept and put it in a creative visual product in the form of animation; (d) the creation of an animated visual learning media with the principle of fast static image display sequentially which creates the illusion of motion to mimic the real motion; and (e) the animation creation process was conducted in stages.

Participants in this study were the fifth semester students of Automotive Engineering Vocational Education program in the Universitas Negeri Semarang, who had completed the automotive electrical system course and currently enrol in the educational media course. The total number of participants was 25 students between the ages of 19-22 years. In this study, the learning process was conducted in the classroom for 3 weeks. The class activity in 1st week was: (a) researcher (as the lecturer) provided learning materials about animation and its example based on the Harrison and Hummell’s concept, namely the creation of visual animation instructional media with the principle of fast static image display sequentially, which creates the illusion of motion to mimic the real motion; (b) students were asked to choose the topic of automotive electrical system learning material from the book to be transformed into a creative product; (c) students were given time a week to get ideas, initiatives, and to create scripts to transform the textual information into visual information; and (d) the students then designed the animation using the software such as MS Powerpoint, Flash, or other software. The activities in the 2nd week consisted of: (a) students presented a script and the design of their animation; (b) other students were given the opportunity to comment and provide input on the draft products; (c) the lecturer provided the input; (d) the presenting students were given time to respond to comments the inputs; and (e) the students were given an opportunity to improve their draft for the final product. The activities in the 3rd week consisted of: (a) each student presented the final product of visual media in the form of animation; (b) the final products were collected; and (c) the final products were assessed by the researcher with the instruments that have been prepared.

Data were collected using the product assessment sheet, comprises of several criteria, including the creativity, the appearance, and the content validity of the products. The creativity of the products was assessed from novelty (the product is original, surprising, and germinal), resolution (the product is valuable, logical, useful, and understandable), and the elaboration and synthesis (the product is organic, elegant, complex, and well-crafted) [19]. The assessment of the products was assessed in terms of attractiveness, layout, and smoothness of motion. The content validity of the product was assessed in terms of validity, the motion validity, and the validity of the overall system. The products were assessed using a Likert scale ranging from 1 to 5 points. The data were analysed using descriptive statistics in the form of average and percentage to determine the level of creativity, appearance, and the validity of the products.

The classification of score were made into the level which have evaluative meaning based on Azwar [50], if the score is \((M + 1,5s) < X\), then it is categorized as a very high; if the score is \((M + 0,5s) < X \leq (M + 1,5s)\), then it is categorized as high; if the score is \((M-0,5s) < X \leq (M + 0,5s)\), then it is categorized as sufficient; if the score is \((M-1,5s) < X \leq (M-0,5s)\), then it is categorized as mediocre;
and if the score is \( X \leq (M + 1.5s) \), then it is categorized as bad. \( M \) is the average results of the assessment, \( s \) is the standard deviation of the results of the assessment, and \( X \) is a score assessment.

3. Result and Discussion

The results of the assessment of learning by creating learning products were presented in the following table 1.

| No | Indikator          | Assessment Aspect | The Average Score (1-5) |
|----|--------------------|-------------------|------------------------|
| 1  | Novelty            | Original          | 3.64                   |
|    |                    | Surprising        | 3.64                   |
|    |                    | Germinal          | 3.52                   |
| 2  | Resolution         | Valuable          | 3.60                   |
|    |                    | Logical           | 3.68                   |
|    |                    | Useful            | 3.72                   |
|    |                    | Understandable    | 3.80                   |
| 3  | Elaboration and synthesis | Organic | 3.48                   |
|    |                    | Elegant           | 3.52                   |
|    |                    | Complex           | 3.60                   |
|    |                    | Well-crafted      | 3.44                   |
|    | **Average score**  | **3.60**          |                        |

The assessment condition was written as follows: if the score was \( 4.9 < X \), then it was categorized as highly creative product; if the score was \( 4 < X \leq 4.9 \), then it was categorized as creative; if the score was \( 3.2 < X \leq 4 \), then it was categorized as quite creative; if the score was \( 2.3 < X \leq 3.2 \), then it was categorized as uncreative; and if the score was \( X \leq 2.3 \), then it was categorized as very uncreative. Table 1 indicates that the average score of the product is 3.60. Therefore, the product is generally categorized as quite creative. The distribution of the product creativity of the participants is shown in Figure 1.

![Figure 1. Distribution of Product Creativity](image)

Pie chart indicates a large portion of products (44%) do not meet the creative criteria as expected. Some of the reasons were: the products did not contain an interesting idea, illogical visualization, also, the products were worthless and could not be used to facilitate learning, the message or information contained on the product was elusive, missing an element of motion that characterized the animation, and were not made carefully. Based on the appearance and the validity of the product, the results of the assessment as shown in table 2.
Table 2. The Results of The Appearance and The Content Validity of The Product Assessment

| No | Indicator | Assessment Aspect                  | The average score (1–5) |
|----|-----------|------------------------------------|-------------------------|
| 1  | The appearance of the product | Attractiveness                  | 3.44                    |
|    |           | Layout                             | 3.62                    |
|    |           | the smoothness of the motion       | 3.20                    |
|    |           | **Average score**                 | **3.39**                |
| 2  | The product validity          | The content validity              | 3.76                    |
|    |           | The motion validity                | 3.68                    |
|    |           | The validity of the overall system | 3.76                    |
|    |           | **Average score**                 | **3.73**                |

The assessment condition was written as follows: if the score was 4.6 < X, then it was categorized as very attractive product; if the score was 3.8 < X ≤ 4.6, then it was categorized as attractive; if the score was 3.0 < X ≤ 3.8, then it was categorized as quite attractive; if the score was 2.1 < X ≤ 3.0, then it was categorized as less attractive; and if the score was X ≤ 2.1, then it was categorized as very unattractive. From Table 2, the average score of the product is 3.39. Therefore, the products were generally categorized as quite attractive. The distribution of the product appearance data is shown in Figure 2(a).

Figure 2. Distribution of The Product Appearance (a), and The Validity of The Product (b)

The number of products which was categorized as bad was only 12%. Some things that are not good in terms of the appearance that the resulting visualization was not beautiful and not attractive to look at; a placement of images, text, and moving elements were imbalanced; and the resulting motion was very rough. Animation as a tool to convey information to the learner must contain elements of validity. Therefore, the validity of the products must also be judged from the validity aspect. The validity product in this study was assessed in terms of the content validity, motion validity in the animation, and the validity of the overall system from the beginning to the product. The assessment result of the level of the product validity is shown in Figure 2(b).

The validity of the products was divided into two categories: namely, the valid product and the invalid product. There were 36% of the products did not meet the elements of validity, in terms of content validity, motion of the animation validity, and the overall contents validity of the electrical system that were visualized. If there was one thing that contained incorrect information, then the product was categorized as not meeting the elements of validity. Common mistakes made by the students were the lack of learning material understanding. Information from the books being studied was partially or completely not understood. Therefore, the concept of product development was invalid. Consequently, it resulted in the invalid visualization. Overview of products produced in the learning in terms of the creative side, the view, and the truth of the contents can be seen on Figure 3.
Figure 3. The Overview of Condition of Creativity, Appearance, And the Validity of The Product

Based on Figure 3, the creative products are the reflection of the students who have the creativity in making the products. Creative products were followed with a great visual appearance of the products and the validity of the content as well. The uncreative products were also followed by an unattractive appearance and the incorrect information about the products. Based on the above results, it can be described that students who were categorized as creative had good results with good content validity. Here is an example of screen shots from two visual products in the form of animation with automotive electrical system theme.

Another example of products in this study was the visualization of how the starting system works on the vehicle (see figure 4). When the system is working, the electrical current flow is visualized by the flow of the green line to all parts of the starter system at work. The idea of this product was to slowly describe the flow of electrical current. Therefore, the phenomenon of how the starter system works can be observable. Based on figure 4, the students can easily understand the working principles than reading the working principle of the starting system in the form of text in a textbook.

Figure 4. The Visualization of The Flow of Electrical Current to The Starter System at Work

Two examples of the above products were the result of creative learning activities that students found new ideas and generated product, be initiative, found relevant information to transform the textual material into a visual concept and put it in a creative visual product in the form of an animated visual media. This product is clearly beneficial for students who wanted to study automotive electrical systems for the first time. The application of the concept of learning by creating through by transforming the textual learning materials into visual animation as creative learning products in this study lead to the discovery of creative ideas of students. Creative ideas need to be put forth in a visual
concept. The ability of students to create ideas should be supported also by the spirit of art and understanding of the content of the learning material. Without the sufficient knowledge and artistry, these ideas were difficult to be realized in the form of products which also should have the valid content and an attractive appearance. Creative and artistic element in the manufacture of the product supported the design and produced a good appearance to meet user requirements [19]. The elements of the learning material mastery supported the validity of the information presented in the product. Consequently, important aspects in learning by creating in this article consisted of three important things that the students need to have during the learning process, the "mastery" of the learning material, "creative", and artistic.

The mastery of the learning material was required as a fundament of the validity of the products. Students who were creative, although they did not understand the material, made an effort in a creative way to produce a good and valid product by studying the required learning materials, identifying difficulties and finding a solution. This was supported by the data (Figure 3) which indicates that the product made by the creative students, the validity of the content can be trusted. On the other hand, the products made by uncreative students, the validity of the contents was also unreliable (the average score of the validity was less than 60%). Products which were categorized as uncreative were 44% and were not suitable for the students’ learning tools. Some possible causes of this impropriety where the students did not understand the learning material about electricity that was presented and did not try to understand it by learning. Creativity is a process to be sensitive to the problem and a lack of knowledge. Therefore, the impropriety of the students’ products in this study can be caused by a lack of sensitivity to the problems and the low mastery of the learning material. Although, they had been given sufficient time (2 weeks), the time did not seem to put to good use by students who were not creative to produce a good product.

The uncreative products produced by the less creative students with low imaginative activity resulted in improper products. The ability to think creatively was what generated ideas for innovative products [20]. For students like this, they had to be encouraged by planting logic for creative learning [21]. Stimulating the creativity of students whose products were less creative could be achieved with intensive assistance by educators for students to think, discover new ideas, and find a variety of information required by the students. Other friends who have high creativity must be activated to help students who were less creative, so the learning environment was surrounded by creative people and activities. Educators need to develop an expressive learning atmosphere that respects originality and creativity. The learning process also need to be supported by the atmosphere full of ideas through varied learning activities to provide an opportunity for students to learn and work with people who have high creativity.

According to Fischer et al. [22], learning process in engineering field must begin with self – depiction of the creative process. This means that educators must understand the true meaning of creativity. An understanding of creativity results in more effective learning so that students will have the ability to develop themselves [23]. Therefore, active learning techniques need to be implemented for the students’ development through activities that involve and motivate students, make students excited that the students’ attention will focus on learning [24]. The generative process on students in an active learning will be formed through the freedom given to students to organize information from textual learning process [17]. Therefore, students can find significance in their learning process and foster a high commitment to achieve learning goals. Learning by doing provides direct experience and knowledge discovery by students. Learning by creating develops students’ ability to innovate by seeking and finding new ideas and applying these ideas in the form of products [19]. In addition to reinforcement or mastery of the learning materials, learning by creating is also expected to result in useful products that can be used by others to learn.

4. Conclusions
The implementation of the learning by creating concept in this study was conducted with the following signs: (a) the technology–aided learning is aimed at creating products through the presentation of information in a visual animation format; (b) generative learning process is defined as transforming textual learning into something new; (c) the learning process is carried out by the productive process through creative learning activities to find new ideas and produce products through the provision of adequate time to change the automotive electrical textual material into a visual concept and transform it in the form of animation products; (d) the creation of the animated visual by the fast display of static images in a sequence to create the illusion of motion; and (e) the process of making the animation was conducted with simplified stages of developing ideas, writing scripts, designing, and production.

Products were generally categorized as the quite creative criteria. However, quite a lot of products (44%) did not meet the creative criteria because the products were made of uninteresting and illogical ideas, did not ease the learning process, the message was difficult to understand, there was not element that characterized the motion animation, and careless preparation. The appearance of products was generally included in the quite attractive criteria. Only 12% of the product was categorized as not good because the visualization was not attractive and uninteresting to look at, placement of images, text, and moving elements were imbalanced; and the resulting motion was very rough. Based on the content validity, there was 36% of the products that did not meet the criteria for content validity because the content, animated motion, and the overall contents of visualized electrical system contained some mistakes. Common mistakes made by the students were the lack of the learning material understanding which resulted in the improper concept of product development, and improper visualization. Creative products are the reflection of the creative students who have the creativity in making the products. Creative products have a great visual products appearance and the good content validity as well. Uncreative products have an unattractive appearance and invalid information of the product.

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