Interaction Effect of Flash-based Interactive Multimedia and Learning Styles in English Learning

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Abstract. This study aims to determine the effect of the use of Flash-based interactive multimedia learning and the student’s learning styles (visual, auditory and kinesthetic). This study uses quasi-experiment. Sampling using purposive cluster sampling by considering the characteristics of the school and obtained 36 students as a control group and 39 students in the experimental group. In the learning process, the control group used the multimedia presentation Powerpoint and experimental group using Flash-based interactive multimedia learning. The research data was collected through the identification test of learning styles and test of student learning outcomes. The data of the research were analyzed with the help of SPSS 24 for windows program, with two-way ANOVA test at 0.05 significance level. The results showed that there is an interaction between the use of Flash-based interactive multimedia learning with learning styles on student learning outcomes.

1. Introduction

English is an oral and written communication tool used in several sectors. In Indonesia, English is one of the compulsory subjects which includes the determination and formulation of student graduation so that they are included in the National Examination subjects at the junior and senior high school level.

Algeo & Pyles [1] and Bodomo [2] stated, language is a voice-based communication system using vocal codes that have conventional meanings that vary according to the agreement of certain people or groups.

Graddol [3] states, English has a significant position, not only as a medium of verbal communication. English skills are divided into four basic skills, namely; listening, speaking, reading and writing [4]–[9]. The four basic skills are interconnected with each other and are divided into two parameters in communication, namely: oral or written communication, and receiving or producing messages.

Referring to the policy of the Indonesian government through Curriculum 2013 on the distribution of English provides a shorter duration, only 2 hours per week for compulsory English language subjects, in addition, learning comes from the creativity and activeness of
students desired. The teacher is expected to be a facilitator, and mentor for students so that student-centered learning can be done well. Various learning methods and strategies have been widely integrated into the English learning process. Various language learning media also have many benefits to improve the quality of students' English. In addition, teachers and schools often provide additional hours to facilitate the process of improving the quality of student learning.

The rapid development of computer technology has made the role of media become quite significant in facilitating the teaching and learning process, especially learning English. Teachers are needed for technology literacy so that they can integrate technology into the learning process. The teacher is no longer the center of the learning process, replaced by creativity and requires students to think critically.

2. Literature Review

2.1. Computer-assisted Language Learning

Along with the growth of information technology, the role of the computer as a language learning aids to be a relatively appropriate choice, because by integrating the use of computers in the process of language learning, then the complexity of the taught material can also be easily accommodated. CALL is one type of multimedia computer-based that is widely used to facilitate the process of language learning.

Related to the use of media in English learning, some terms of multimedia utilization in learning are developed [10], such as; Computer-Aided Instruction (CAI); Computer-Assisted Learning (CAL); Computer-Assisted Language Instruction (CALI); Computer-Assisted Language Teaching (CALT); Computer-Assisted Language Learning (CALL); Computer-Assisted Language Testing (CALT) or Computer-Adaptive Learning Testing (CALT); Computer-Adaptive Testing (CAT); Computer-Assisted Teaching (CAT); Computer-Based Training (CBT); Computer-Mediated Communication (CMC); Computer-Mediated Instruction (CMI); Intelligent Computer Assisted Language Learning (ICALL); Technology Enhanced Language Learning (TELL); Web Enhanced Language Learning (WELL).

The development of CALL is divided into three levels, namely: CALL Behavioristic, CALL Communicative, and CALL Interactive [11].

2.1.1. CALL Behavior. Behavioristic CALL emerged in the late 1960s and was used extensively in the 1970s influenced by linguistic teaching methods. On this CALL stage, repetitive language training is used, and computers do not allow students to work at individual speeds, which impede motivation.

2.1.2. CALL Communicative. During the 1980s the behavioristic approach to language teaching experienced rejection at the theoretical and pedagogical levels, and personal computers created greater possibilities for individual work in school. Communicative CALL is associated with cognitive theories that emphasize the learning to the process of discovery, expression, and development. Under the influence of Communicative Language Teaching, CALL
communicative advocates argue that computer-based activity should focus more on the use of forms. In addition, the focus is not so much of what students do with computers, but what they do with each other while working on the computer.

2.1.3. **CALL Interactive.** In the 1990s, CALL communicative began to be knocked. The second new language acquisition theory and social-cognitive outlook affect many teachers and guide them to use more socially and learner-centered methods. This time, the emphasis is placed on the use of language in an authentic social context. Project-based, task-based and content-based approaches all strive to integrate learners in an authentic environment, as considerably as to integrate various language learning skills. In an integrative approach, pupils can use various technical tools as an ongoing language learning process rather than visiting the computer lab every week for isolated exercises.

2.1.4. **Advantages of CALL.** CALL in its development has various advantages if used correctly. The advantage of using CALL in learning, among others; Student-centered learning can be implemented well and will certainly provide significant benefits to improve the quality of student learning. In addition, the teacher will certainly function as a facilitator and manager in the teaching and learning process, where the teacher will guide students to be able to achieve learning competencies. CALL can accommodate learning material and allows the material to be transformed in the form of text, images, sound, and even video. So that the amount of material charged to students will be easily accommodated. Thus, various materials previously presented using different media can be accommodated in multimedia learning programs.

2.1.5. **Disadvantages of CALL.** Besides having the benefits, CALL also has several weaknesses that make it ineffective in some situations, including; Inadequate infrastructure facilities in some schools, inadequate computer facilities, most importantly, lack of knowledge of teachers in the field of information technology or in the operation of computers.

These problems will become a strong stumbling block in the realization of improving the quality of language learning by integrating CALL in the learning process. If this problem cannot be overcome, then it will be difficult to position students to be active and creative in the learning process. Indeed, the density of material that must be learned by students with a relatively narrow time.

In the end, learning will remain teacher-centered with the lecture method and rely on the blackboard. In addition, the diversity of characteristics of students also do not get the same treatment in learning. Therefore, the presence of CALL in learning is able to support the improvement of the quality of English learning.
2.2. Learning Styles

Learning styles affect a person in obtaining and processing information. Learning styles are a combination of how they acquire, organize and process information, and different learning contexts can influence student learning styles [12]–[14]. By identifying learning styles, it will be easier for teachers to determine methods, strategies and media that can improve the learning process [15]–[19].

To recognize student learning styles, various instruments have been developed, including; Honey and Mumford Learning Questionnaire, dividing four types of students; Activists-Reflectors, and Theorists-Pragmatics. Grasha-Riechmann Learning Styles is a scale applied to categorize student styles into; competitive, collaborative, avoidance, participants, dependents, independent. The Felder Learning Styles Index is an online media that is applied to assess preferences on four dimensions of learning style models; Visual-Verbal, Sequential-Global, Active-Reflective, and Sensing-Intuitive [20]. Witkin Cognitive Learning Styles [21] classify learning styles into; independent field and independent field. The VARK questionnaire, dividing the modality into; Visual, Auditory, Read/Write and Kinesthetic [22].

In conclusion, there are usually two main categories of how students learn. First, how students get information easily, organize and process information. Second, if students know their own learning style, they can learn faster and easier.

2.2.1. The Importance of Learning Styles.

Learning styles is one of the most important issues in learning. Students should recognize their own learning styles in order to make it easier for them to learn something. In this way, students will relatively easily gain and improve their understanding without having to depend on the help of others. Each learning opportunity is in the hands of students to be able to use different ways and develop learning styles to some extent [20]. Learning styles are important for many reasons, including: first, everyone's learning styles is different from each other naturally. Second, learning styles provide teaching opportunities by using various methods and effective ways. Using just one model will produce a monotonous learning environment, thus, not everyone can enjoy the lesson. In other words, learning and teaching are just words without significant results. Third, teachers can manage many things in the learning process if they really recognize the learning styles of their students. Teachers may not recognize every detail; however, being aware of student learning styles, psychological qualities, and motivational differences will help to organize the lessons appropriately and in accordance with the conditions [20], [23].

2.2.2. The Advantages of Identifying Learning Styles.

Learning styles have an important position in human life. When people know their learning styles, they will integrate it into the learning process so they will learn more easily and rapidly. Another advantage of identifying learning styles is to help students become effective problem solvers. The most successful individuals are in solving the problems they face, the more control they will take over their own lives. It is important that individuals receive learning according to their learning styles. A person educated in an area who has no connection to their learning styles may lack confidence and they may be less successful. Knowledge of learning styles also informs students why they
learn differently from others, because it helps control the learning process. This is important because one of the most important signals in learning is learning to be autonomous, i.e. for individuals responsible for their own learning. Therefore, they should know what their learning styles are. This should be part of the learning process to enable individuals to acquire the ever-changing knowledge, without the help of others. In brief, self-confidence in learning will increase consistently as learners learn how to learn. Understanding something in a suitable way reduces teacher dominance. In other words, the teacher guides the students. The students are responsible for their learning, and everything is under their control. They seek answers to problems and benefit from their unique appearance and preferences in their learning styles. They will identify their goals, unlike those whose learning styles are not identified.

2.2.3. Visual, Auditory, Kinesthetic. Visual learners prefer the use of images, maps, and graphic organizers to access and understand new information. These preferences include depictions of information about maps, spider diagrams, graphs, graphs, flowcharts, labeled graphs, and all symbolic arrows, circles, hierarchies and other devices, which people use to represent what can be presented with words. Auditory learners learn more about the new content through listening and speaking in situations such as lectures and group discussions. Aural learners use repetition as a learning technique and benefit from the use of mnemonic devices. This mode of perception describes the preference of information "heard or spoken." Learners who have this as their main preference report that they learn best from lectures, group discussions, radio, email, using cell phones, talking, talking and speaking. Kinesthetic learners most understand the information through tactile information representation. These students are learners and learn best by thinking things through by hand. By definition, this modality refers to perceptual preferences related to the use of experience and practice. Although such experiences may require another major modality, the person choosing this mode is connected to reality either through real personal experience, examples, practice or simulation.

2.3. Learning outcomes

Learning is a lasting change in behavior, or in the capacity to behave in certain ways, resulting from practice or other forms of experience [24]. Learning outcomes are changes in behavior that occur after following the learning process, whether it changes knowledge, skills, and attitudes.

In line with Arifin [21], learning achievement is usually related to aspects of knowledge, while learning outcomes include aspects of student character formation. Learning achievement is an indicator of the quality and quantity of knowledge that is known by students as a symbol of a satisfying desire to know, information about educational innovations, but also can be an internal or an external indicator of educational institutions. Degeng (2013) states, that learning outcomes are effects that can be an indicator of the use of methods. Learning outcomes are one of three learning variables in addition to learning methods and conditions.

Through the learning process, of course, there will be learning outcomes obtained. One common way to find out learning outcomes is to assess or assess students' cognitive abilities through formative or summative tests, including knowledge and understanding, even if the results are
not always in line with expectations, even different for each participant educating, depending on the level of understanding of each student. To get results that are in line with expectations, learning needs to be done with a high awareness of the orientation expected from the learning process carried out, both by the teacher by providing learning through various methods so that students are motivated to follow the learning process.

Based on the above definition, it can be concluded that learning outcomes are variables that function to determine the level of understanding of students both quantitatively such as the acquisition of knowledge scores and practices or qualitative such as changes in attitudes and behavior after going through process learning.

2.3.1. Factors Affecting Learning outcomes. Engaging the media in the learning process is one form of improving school performance, in this case, the teacher, so that the learning objectives can be achieved as planned. Multimedia is the evolution of conventional learning media. Multimedia is the result of the development of information and communication technology. Integration of multimedia in learning can accommodate the regulations of the ministry of national education [26] that learning activities should be carried out systematically through exploration, elaboration, and confirmation process. Interactive multimedia can explore students' ways of thinking, and can confirm the knowledge gained. This is a fun form of the learning process so that students become motivated to be actively involved in the learning process. With increasing student motivation, the expected results of the learning process can be achieved. Mayer (2009) states, people learn better than words and images rather than words, so interactive multimedia is the right choice as a medium for teachers to convey learning compared to using conventional media and traditional methods. In many studies, it has been proven that the use of interactive multimedia in the learning process will make learning outcomes better. Shah & Khan (2015) concluded that students who receive instruction using interactive multimedia, get better results than students who get teaching using conventional media, and also have a positive impact on the attitude of students. Ilhan & Oruç (2016) recommends the use and development of multimedia in learning because it has a positive impact on the development and learning outcomes of students.

In addition to the use of multimedia as a learning resource for learning, Slameto (2010) explains that there are two factors that can affect the learning outcomes of learners, namely: 1. Internal factor is grouped into two parts, the physiological factors of learners, such as health condition; physical factors in the form of disability and the second is the psychological factors of learners, such as attention to the learning process; interest to learn; talent owned and readiness learners; 2. External factors are outside factors around the learner, among others; curriculum, media and teaching methods used by teachers, relationships, and learning environments, discipline, learning tools, availability and conditions of learning facilities such as study buildings and libraries.

2.3.2. Assessment of Learning Outcomes. Evaluation is an independent and systematic investigation of how, why, and to what extent the goals or objectives are achieved [31]. According to Presiden Republik Indonesia (2003) evaluation of learning outcomes of learners
conducted by educators to monitor the process, progress, and improvement of student learning outcomes on an ongoing basis. Permendikbud (2013) stated that assessment is a series of activities to obtain, analyze, and interpret data that is done systematically and continuously as decision-making materials. Based on the above statement can be concluded that the assessment of learning outcomes, aims to describe learners' learning skills, so that teachers can know the success of the process of education and teaching in schools, as a basis for determining follow-up, and as a form of accountability of the institution to the parties who are interested.

3. Methodology

This study uses a quasi-experimental design, because researchers cannot do the full control of variables. Doubts about this correspondence resulted in this design being called an unequal control group design.

In this design, there were two groups that were randomly selected, the experimental group, and the control group. The experimental group was taught using Flash-based interactive multimedia, while the control group was taught using multimedia PowerPoint presentations. The research design can be seen in the following table;

| X1 | X2 | Y   |
|----|----|-----|
| O1 | B1 | A1  |
| O3 | B1 | A2  |
| O5 | B1 | A3  |
| O7 | B2 | A1  |
| O9 | B2 | A2  |
| O11| B2 | A3  |

Table information:
O1, 3, 5, 7, 9, 11 : Pre-test.
O2, 4, 6, 8, 10, 12 : Post-test.
A1 : Visual learning style group
A2 : Auditory learning style group
A3 : Kinesthetic learning style group
B1 : Flash-based multimedia
B2 : Powerpoint-based multimedia

This study examines three variables, namely; the use of Flash-based interactive multimedia learning as an independent variable (X1) is a learning multimedia used in the experimental group and learning styles as a moderator variable (X2), is a variable that can strengthen or weaken the use of interactive multimedia on independent variables, while the results of learning as a variable bound (Y), the variable that gets the influence of the independent variable and moderator. The relationship between variables can be seen in the following figure:
Figure 1. Relationship among variables

Data Collection and Analysis
A. The research procedure is explained as follows;

1. Learning Style Questionnaire will classify each student's learning style adopted from the Center for Advanced Research on Language Acquisition-University of Minnesota [34].
2. Pre-test containing English language material, data from the initial testing will be used to obtain information on the normality and homogeneity of sample data. Multiple choice questions are used with 5 alternative answers as the English language test.
3. The treatment was given to the experimental group in the form of learning using Flash-based interactive multimedia learning in English subjects in the experimental group and multimedia Powerpoint presentations for the control group.
4. Post-test contains multiple choice questions in English, using 5 alternative answers.

4. Result and Discussion
4.1 Result
Data analysis using ANOVA technique is used to answer the problem about the presence or absence of influence of learning media utilization and learning styles to student learning outcomes. The results of this analysis will be used as a basis for decision making in testing the research hypothesis.

Anova test is used to determine the effect of independent variables on the dependent variable. In this study, the ANOVA test is used to examine the effect of learning that utilizes Flash-based interactive multimedia learning and learning styles (visual, auditory and kinesthetic) of students on student learning outcomes.

The results of the ANOVA test are summarized in Table 2
Table 2. Two-way anova test result

| Source                      | Type III Sum of Squares | df | Mean Square | F     | Sig. |
|-----------------------------|-------------------------|----|-------------|-------|------|
| Corrected Model             | 477.668                 | 5  | 95.534      | 3.494 | .007 |
| Intercept                   | 344963.520              | 1  | 344963.520  | 12618.071 | .000 |
| Learning-Style              | 208.264                 | 2  | 104.132     | 3.809 | .027 |
| Group                       | 137.777                 | 1  | 137.777     | 5.040 | .028 |
| Learning-Style * Group      | 274.816                 | 2  | 137.408     | 5.026 | .009 |
| Error                       | 1886.380                | 69 | 27.339      |       |      |
| Total                       | 412864.272              | 75 |             |       |      |
| Corrected Total             | 2364.048                | 74 |             |       |      |

a. R Squared = .202 (Adjusted R Squared = .144)

Based on table 2, can be described as some findings, among others;

The influence of Learning-Style on Learning outcomes in the Table shows a significance level of 0.027 (0.027 <0.05), means that learning styles has a significant effect.

The significance of the group effect (control and experimental) on learning outcomes in Table 16 is 0.028 (0.028 <0.05), it showed that the control and experimental group significantly influence.

The influence of learning styles and groups (Learning-Style*Group) on students’ learning outcomes has a significance score of 0.009 (0.009 <0.05), so it can be concluded that learning style (group-learning) has a significant effect.

Figure 2. Interaction plot
Based on the picture above, visual students who were taught using Flash-based interactive multimedia learning had the highest results from other students, but auditory and kinesthetic students who were taught using multimedia powerpoint presentations had better results than visual students, thus forming interaction lines in the plot above. Can be concluded that; There is an interaction between the use of Flash-based interactive learning multimedia and student learning styles.

| (I) Learning Style | (J) Learning Style | Mean Difference (I-J) | Std. Error | Sig.  | 95% Confidence Interval | Lower Bound | Upper Bound |
|--------------------|--------------------|-----------------------|------------|-------|-------------------------|-------------|-------------|
| Visual             | Auditory           | 1.5045                | 1.34783    | .507  | -1.7240 - 4.7329        |             |             |
|                     | Kinesthetic        | 4.0442*               | 1.66038    | .045  | .0671 - 8.0213          |             |             |
| Auditory            | Visual             | -1.5045               | 1.34783    | .507  | -4.7329 - 1.7240        |             |             |
|                     | Kinesthetic        | 2.5398                | 1.72201    | .309  | -1.5850 - 6.6645        |             |             |
| Kinesthetic         | Visual             | -4.0442*              | 1.66038    | .045  | -8.0214 - .0671         |             |             |
|                     | Auditory           | -2.5398               | 1.72201    | .309  | -6.6645 - 1.5850        |             |             |

Based on observed means.
The error term is Mean Square (Error) = 27.339.
*. The mean difference is significant at the .05 level.

Based on the table above, there is an interaction of learning styles on visual and kinesthetic learning styles, indicated by the presence of a sign (*) in the mean difference column. Visual learning style interacts with the kinesthetic learning style with a mean difference of 4.0442, and a significance value of 0.045 (0.045 <0.05).

4.2 Discussion

In this study, the ANOVA test results showed that there was an interaction effect between the application of Flash-based interactive multimedia learning and learning styles on student learning outcomes, obtained a significance value of 0.009 (0.009 <0.05), a significance value smaller than 0.05. Based on this comparison, it can be concluded that there is an interaction between the use of interactive multimedia learning and student learning styles on learning outcomes. The interaction between learning styles is shown in Table 3, there is an interaction between kinesthetic and visual learning styles, it shows a mean difference of 4.0442 with a significance value of 0.045 (0.045 <0.05), in the comparison table of Tukey HSD.

The results of this study indicate that there is an interaction between the application of interactive multimedia learning and learning styles on student learning outcomes. This interaction shows that the two variables together influence student learning outcomes. This finding is in line with research conducted by Surjono [35], who concluded that the use of multimedia in accordance with the characteristics of the learning style of students can provide better learning outcomes than students who use multimedia but not in accordance with the learning style. In other words, learning styles can affect student achievement [36]. In line with
that, the findings of Bhattacharyya & Shariff [37] proved that adjusting learning styles in a variety of learning approaches can increase students' learning potential and abilities.

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