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Analysis of the Application of the Group Investigation Learning Model and Its Influence on Students' Critical Thinking Abilities on Chemical Elements in Eastern Europe

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ABSTRACT

Purpose of the Study: Understanding implicatures in TOEFL Short Dialogues is difficult. It is essential to develop web-based media to boost implicature understanding. This current study *aimed at* testing the implicature inference-making ability of English teachers, identifying the factors that affect listening difficulties and developing web-mediated audio-visual books for the TOEFL.

Methodology: This is a three-phase R & D model: 1) 'Research Phase' (Testing the English teachers listening ability; Examining factors affecting implicatures understanding; and Profiling the English teachers listening abilities); 2) 'Development Phase' (Constructing the test instrument; Formulating Learning Objectives; Selecting Audio-visual materials, Designing the web-mediated audio-visual book; Validating and revising the book) and 'Production Phase' (Dissemination and Mass Production).

Main Finding: The products of the 'Research phase': 1) Listening ability, 2) Factors affecting listening, 3) Profile of the English teachers' pragmatic ability. There are five primary causes of difficulty, 'Speech Rate Delivery,' 'Voice,' 'Sentence Complexity,' 'Mishearing,' and 'Colloquial.' The product of the 'Development Phase' is a 'Web-based audiovisual book for the TOEFL Short Dialogues.' All lessons are aided with online links to audio and videos. Finally, the product of 'Production Phase' is a massed published book.

Novelty/Originality of the Study: No single study has ever been reported that focused on developing a web-mediated audio-visual listening book to boost the understanding of implicatures in the TOEFL Short Dialogues.

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1. INTRODUCTION

Thinking is the main characteristic that distinguishes humans from other creatures on this earth. Process thinking is a natural, natural thing, and is the nature of living humans [1]–[3]. The quality of a person's life can be said to be determined by how he thinks. Moment We ourselves think, often what we think is biased, does not have a clear direction, is partial, and is often emotional or seems *egocentric* (putting our own interests first). This is where we are required to have critical thinking skills. The goal of critical thinking is simple to ensure as far as possible that our thinking is valid and correct [4]–[6].

One of the main goals of schooling is to improve students' critical thinking skills, making rational decisions about what to do or what to believe [7]–[9]. Critical thinking is one of the future competencies that students need. Critical thinking is a deliberate effort carried out actively, systematically, and following the principles of logic and considering various points of view to understand and evaluate information with the aim of whether the information is accepted, rejected or deferred assessment [10-12].

Critical thinking skills are very important for students because with these skills students are able to act rationally and are able to choose the best alternative options for themselves. Students who have critical thinking skills will always ask themselves when facing any problem to determine what is best for themselves [13]–[15]. Thus, empowering critical thinking skills in students is very important, which can be integrated through learning methods that will be proven to be able to empower and train students' critical thinking skills [16]–[18].

In the 2013 curriculum, teachers are only facilitators in classroom learning, not as information centers. When teachers are information centers, students find it difficult to build their own knowledge so that students find it difficult to understand the subject matter [19]–[21] . If the transfer of knowledge from teacher to student is not good, it will result in the material received being meaningless. In reviewing learning resources, students must have skills, one of the skills that must be possessed is skills in analyzing, evaluating, inferring, interpreting and explaining. This skill is a component of students' critical thinking abilities, when students have this skill it will be easier for students to understand all chemical material so that students can understand the material in depth and meaningfully [22-24].

Based on the results of an interview with one of the chemistry teachers at an Eastern European school, students felt less happy about studying elemental chemistry in studying this material, because they considered elemental chemistry to be material that had to be memorized. In this material, if the teacher cannot deliver the lesson well then the teaching and learning process will seem boring. When students feel bored, active learning will not be achieved. Active learning will be seen by creating a learning atmosphere that is comfortable, enjoyable, and excites students in participating in learning [25], [26]. According to this chemistry subject teacher, in the learning process on material such as elemental chemistry, students tend to like discussing. Because by discussing they feel more involved in the learning process. When discussing they not only get information from the teacher but also from their friends and students can exchange information with each other. For this reason, teachers create variations in learning models. One of them is the group investigation learning model which guides and encourages students in learning involvement.

The cooperative learning model is a learning model that is often applied to improve students' understanding abilities and intelligence as well as building critical thinking skills. There are various types of cooperative learning models. One learning model that is expected to be able to train critical thinking skills is the group investigation (GI) type cooperative learning model. According to Kurniasih, group investigation is a small group to guide and encourage students in learning involvement [27], [28] . This method requires students to have good abilities in group process skills. Slavin put forward the group investigation type cooperative learning model consisting of six stages including: grouping, planning, investigation, organizing, presenting, and evaluating. At the investigation stage students can practice the ability to analyze, interpret, evaluate and infer. At the presenting and evaluating stage, students can practice skills in evaluation, provide explanations of the results of the investigations being studied and respond to questions from other groups regarding the results of the study of elemental chemistry material. So this group investigation type cooperative learning model is a solution for training students' critical thinking skills .

Based on the description above, the researcher will conduct research entitled Analysis of the Application of the Group Investigation Learning Model and its Influence on Students' Critical Thinking Ability in Chemical Elements in Eastern European Countries

2. RESEARCH METHOD

This research is a correlational descriptive research. The design used in this research is a mix method. The mix method used is a concurrent embedded type where qualitative data supports quantitative data. This research used one class to see the effect of implementing the group investigation learning model on students' critical thinking abilities.

In this research, there are 2 types of data that will be collected, namely data on the implementation of the group investigation learning model by teachers and students and data on students' critical thinking abilities. This data was collected by direct observation at each meeting during the learning process using an observation sheet. Observations were carried out by 5 observers, 4 of whom observed the implementation of the group investigation model by students and the students' critical thinking skills. Each of them observed 9 students, while 1 person observed the implementation of the group investigation model by the teacher.

a. Analysis of the Observation Sheet for the implementation of the *group investigation model* by teachers and students

Table 1. Categories of implementation of the group investigation model by teachers and students

No	Score %	Criteria
1	81.25-100	Very good
2	62.46-81.21	Good
3	43.67-62.42	Pretty good
4	24.89-43.64	Not good

Data from the assessment of the implementation of the group investigation learning model by teachers and students, the data obtained was then processed using the following formula:

$$Presentase = \frac{\Sigma skor\ hasil\ observasi}{skor\ maksimum} x\ 100\% \quad \ldots (1)$$

b. Analysis of critical thinking ability observation sheets

Table 2. categories of students' critical thinking abilities

No	Score %	Criteria
1	81.25-100	Very good
2	62.46-81.21	Good
3	43.67-62.42	Pretty good
4	24.89-43.64	Not good

On the observation sheet, students' critical thinking skills use a formula to find the average percentage as follows:

$$Presentase = \frac{\Sigma skor\ hasil\ observasi}{skor\ maksimum} x\ 100\% \quad \ldots (2)$$

The statistical hypothesis in this research is:
H0 : $\mu = 0$ (tidak ada pengaruh)
Ha : $\mu \neq 0$ (ada pengaruh)

The relationship that will be seen is the implementation of the group investigation learning model with critical thinking skills. The implementation of the group investigation learning model should be reviewed by teachers and students, but can be represented from data on the implementation of the model by students, because the activities carried out by students during the teaching and learning process are the result of the activities carried out by the teacher. However, to ensure this, it is necessary to test the similarity of average implementation in terms of both teachers and students using the formula [29]

$$t_{hitung} = \frac{X_1 - X_2}{Sgab\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \text{ dengan}$$

$$S^2 = \frac{(n_1 - 1)S_1^2 + (n_1 - 1)S_2^2}{n_1 + n_2 - 2} \quad \ldots (3)$$

Where:
X_1 = average implementation of the model by teachers
X_2 = average implementation of the model by students
n_1 = number of teacher meetings
n_2 = number of student meetings
S= combined standard deviation value
S_1 = standard deviation value of the teacher's implementation of the model
S_2 = standard deviation value of model implementation by students

According to sampling distribution theory, the t statistic has a student distribution with dk = ($n_1 + n_2 - 2$). The test criteria are $X_1 = X_2$, if $-t_{table} < t < t_{table}$. Where the t_{table} is obtained from the t distribution list with dk = ($n_1 + n_2 - 2$) and probability ($1 - {}_{1/2\acute{a}}$) for $\alpha = 0.05$. G*roup investigation* learning model by students and students' critical thinking abilities using *SPSS* 19. The correlation analysis used was *bivariate Pearson correlation analysis.* After obtaining the correlation value, the value is then interpreted using the correlation coefficient interpretation guide in table 3 below:

Table 3. Guidelines for Interpreting Correlation Coefficients

Coefficient interval	Relationship Level
0.00 – 0.199	Very low
0.20 – 0.399	Low
0.40 – 0.599	Currently
0.60 – 0.799	Strong
0.80 – 1.000	Very strong

To see the significance of the influence of variable X and variable Y, a further test was carried out using the t test. However, before carrying out the t test, the data must be tested for normality and homogeneity first. The formula for the t test is as follows [30] :

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \quad \ldots (4)$$

Information :
n= number of trial respondents
r= correlation coefficient

The calculated t price is then compared with the t table price (attachment), for α = 5% with dk= n – 2. Hypothesis acceptance criteria, accept Ha $_{if}$ tcount is greater than ttable (tcount $_{>}$ ttable $_{)}$, otherwise reject H $_{a}$ and accept H_0.

3. RESULTS AND DISCUSSION

Based on the activity observation sheet data on the implementation of the group investigation model by teachers, it can be seen that the percentages produced vary and increase at each meeting. This can be seen at the first meeting only a percentage of 75% was obtained in the Good category, at the second meeting the percentage obtained rose to 82.1% in the very good category, this was because the teacher studied the shortcomings in teaching at the first meeting by looking at the activity observation sheet. teacher observed by the observer. with an average percentage of 78.55% in the good category.

The percentage shows that the implementation of the group investigation learning model applied by school teachers in eastern European countries has been implemented well. Based on observation sheet data, the implementation of the group investigation model by students experienced an increase in percentage at each meeting. At the first meeting the percentage obtained was 72%, and at the second meeting 77%.

From the data per category, it can be seen that some students who were in the good category at the first meeting had an increase in their scores at the second meeting, therefore some of them were in the very good category so that the percentage data for the very good category had increased. Meanwhile, there was a decline in the quite good category at each meeting because some of the students were in the good category, while in the not so good category at the first meeting until the second meeting there was not a single student occupied.

These findings indicate that the implementation of the group investigation learning model by students is going well and students are starting to get used to the implementation of the group investigation learning model by the teacher. According to Haris [31] , three main things that teachers must pay attention to when implementing teaching strategies. The first is the teaching stage (planning a learning plan), the second is using a teaching approach (props) and the third is teaching principles (mental preparation). Preparing yourself before teaching according to these three aspects will make the teacher ready and full of confidence to enter the classroom, because the teacher already knows the method that will be used to explain the lesson material.

The implementation of the group investigation learning model can help students to develop understanding of concepts and subject matter, develop the ability to share information and draw conclusions, and develop the ability to consider other values of a subject matter. So that student participation in the learning process also increases [9], [32].

The implementation of the model by students is the implementation of the model from the teacher. This is proven by the average similarity test between two parties, between data on the implementation of the model by the teacher and data on the implementation of the model by students. The results obtained from the average similarity test are worth t = $_{0}$, 5015 is then compared with t $_{table}$ = 4.3 with dk = 2 and a significance level of 0.05 so that -t $_{table}$ < t $_{count}$ < t $_{table}$ = (-4.3<0.5015<4.3). And can It was concluded that data on model implementation activities by students could represent model implementation activity data by teachers to be correlated with data on students' critical thinking abilities.

It can be seen that the percentage obtained is different at each meeting, at the first meeting the percentage of students' critical thinking skills was 70.3% which was included in the good category and at the second meeting the percentage obtained was 75% which was also included in the good category. From the

percentage of these two meetings, an average percentage of 72.65% was obtained which was categorized as good.

Of the 7 existing indicators of critical thinking, such as being responsive in recognizing problems, organizing and expressing opinions, defending opinions with logical reasons, doubting friends' findings, testing the similarities of ideas that arise and concluding, finding various alternative answers to a problem and being interesting. conclusions from various information, have been reached well. As stated by Miraningsih [33], in general, one of the criteria for learning success is the success of students in completing a series of tests, both formative tests, summative tests, and skills tests which achieve an average success rate of 60% [34].

Based on the product moment correlation formula, the rxy value is 0.710, which if interpreted has a strong relationship level. Then a t test was carried out, where previously the data was tested for normality and homogeneity. Based on calculations using SPSS 19, the data is normally distributed and homogeneous. Following are the results of the t test

Table 4. T test of students' critical thinking abilities in Romanian, Estonian, Bulgarian

School	Variable	t	df	Sig. (2-tailed)	Mean Difference
School in Romanians	students' critical thinking abilities.	16,145	20	,025	65.55553
School in Estonia	students' critical thinking abilities.	15,811	20	,022	65.55553
School in Bulgaria	students' critical thinking abilities.	20,352	20	.028	80.83331

Then proceed with the t test, the t test here is carried out to see the influence between the implementation of the *group investigation learning model* by students and students' critical thinking abilities. Based on calculations, the $_{\text{calculated t value}} > t_{\text{table}}$ at a real level of 0.05 means H_0 rejected and H_a accepted. In this way, this can test the truth of the hypothesis, namely that there is an influence between the implementation of *the group investigation* learning model on students' critical thinking abilities in chemical elements in eastern European schools. It can be seen that schools in Romanian have a sig of 0.025. It can also be seen that schools in Estonia have a sig of 0.022. It can be seen that schools in Bulgaria have a sig of 0.028. so it can be concluded that the sig (2-tailed) in each school is smaller than 0.05 so that there are differences in the *group investigation learning model* on students' critical thinking abilities in chemical elements in eastern European schools.

This is in line with the results of research conducted by Miraningsih, et al, who conducted research in their thesis entitled application of the *group investigation type cooperative learning model* to train students' critical thinking skills on the main material of acid base class XI MIA Senior high school 2 Magetan. The research results show that (1) the average percentage of implementation of the *group investigation type cooperative learning model* in phase 1 was 85.42% (very good), phase 2 was 87.50% (very good), phases 3, 4 and 5 were 79.17% (good) and the closing phase was 91.70% (very good); (2) students' critical thinking skills were successfully trained with an increase in test scores as seen through the *N-gain* value obtained by each student with an increase of 60% with high criteria, 33% with medium criteria and 7% with low criteria. Based on the research results, it can be concluded that the application of the *group investigation learning model* can improve critical thinking skills and student learning outcomes in acid-base material [34].

4. CONCLUSION

The conclusions obtained in this research are: The implementation of the Group Investigation learning model on elemental chemistry material was carried out well and experienced an increase at each meeting in terms of the percentage of observations by teachers and students. and reinforced with qualitative data based on observer notes during the learning process. Students' critical thinking abilities in elemental chemistry material have increased, this is shown in the quantitative and qualitative observation sheets at each meeting. There are influences and differences between the implementation of the Group Investigation model on students' critical thinking abilities in class element chemistry material in schools in eastern European countries. Based on the results of research conducted by the author and based on the conclusions above, the author recommends: Group investigation is a model that requires student activity. When using this model, teachers should consider time allocation so that learning is truly maximized. Class control by the teacher during the learning process, especially during discussions, is very necessary to direct and guide communication between students, so that students' questions and answers will be more focused.

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