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The Effect of Generative Learning Strategies in Developing Productive Thinking Skills in English Among the University Students

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A B S T R A C T

This study aims to reveal the effect of some generative learning strategies on developing university students' productive thinking skills in English language. Also, to reveal which generative learning strategies have more effect on students' productive thinking skills. The participants were 57 male and female students from 2nd grade at the Department of English, College of Arts, University of Anbar during the second semester of the academic year 2023-24. An instruction based- summarizing, mapping, drawing, imagining, self-testing, self-explaining, teaching, and enacting proposed program was used to train the students to develop their productive thinking skills. A pre-test and a post-test were used to collect the data of the study. The results revealed a significant difference between the mean scores of the experimental group and the control group in favor of the experimental group students. Additionally, there was no significant difference at (α=0.05) between the productive thinking skills of male and female students due to the generative learning strategies. The most effective generative learning strategies for developing students' productive thinking skills were ranked as follows: mapping, self-explaining, self-testing, summarizing, teaching, enacting, drawing, and imagining. It is concluded that students preferred strategies that provided more positive facilitation compared to others in enhancing their productive thinking skills. The selection of strategies was influenced by factors such as ease of use, usefulness, and those that saved time and effort for the students.

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أثر استراتيجيات التعلم التوليدي في تنمية مهارات التفكير المنتج في اللغة الإنجليزية لدى طلبة الجامعة

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الخلاصة:

تهدف الدراسة إلى الكشف عن تأثير بعض استراتيجيات التعلم التوليدي في تنمية مهارات التفكير المنتج في اللغة الإنجليزية لدى طلبة الجامعة. وكذلك الكشف عن أيّ استراتيجيات التعلم التوليدي لها تأثير أكبر على مهارات التفكير المنتج لدى الطلبة. بلغ عدد المشاركين 57 طالبا وطالبة من الصف الثاني في قسم اللغة الإنجليزية بكلية الآداب بجامعة الأنبار خلال الفصل الدراسي الثاني من العام الدراسي 2023-2024. تم استعمال برنامج مقترح قائم على التلخيص، والرسم، والتخيل، والاختبار الذاتي، والتفسير الذاتي، والتدريس، والتنفيذ لتدريب الطلبة على تنمية مهارات التفكير المنتج لديهم. تم استعمال اختبار قبلي واختبار بعدي لجمع بيانات الدراسة. تم استخراج صدق وثبات البرنامج وكذلك الاختبارين القبلي والبعدي. اظهرت نتائج الدراسة وجود فرق ذي دلالة إحصائية بين متوسط درجات طلاب المجموعة التجريبية والمجموعة الضابطة لصالح طلاب المجموعة التجريبية. بالإضافة إلى ذلك، لا يوجد فرق ذو دلالة إحصائية عند مستوى (α=0.05) بين مهارات التفكير الإنتاجي لدى الطلاب الذكور والإناث يعزى الى استراتيجيات التعلم التوليدي. وكانت أكثر الاستراتيجيات التوليدية فعالية في تطوير مهارات التفكير الإنتاجي للطلاب مرتبة على النحو الآتي: التخطيط، الشرح الذاتي، الاختبار الذاتي، التلخيص، التدريس، التمثيل، الرسم، والتخيل. واستُنتج أن الطلاب فضلوا استعمال الاستراتيجيات التي وفرت تسهيلات أكثر إيجابية مقارنة بالاستراتيجيات الأخر في تطوير مهارات التفكير الإنتاجي لديهم. وكان اختيار الاستراتيجيات معتمداً على عدة عوامل مثل سهولة الاستعمال ، والفائدة، وأفضلية الاستراتيجيات التي توفر الوقت والجهد للطلاب.

الكلمات المفتاحية: استراتيجيات التعلم التوليدي، مهارات التفكير المنتج، استراتيجية رسم الخرائط، استراتيجية التفسير الذاتي، استراتيجية الاختبار الذاتي، استراتيجية التلخيص، استراتيجية التدريس، استراتيجية التنفيذ، استراتيجية الرسم، واستراتيجية التخيل.

Introduction

Wittrock introduced the term generative learning in 1970, which encourages learners to generate knowledge rather than learn it directly from the teacher. It is a process of linking the student's prior knowledge with new knowledge that generates cognitive information that the student learns and retains for a long time (Klingenberg, et al., 2020).

Statement of the Problem

Since mid-2021, there has been a rapid spread of artificial intelligence tools, applications, and educational services that provide students and professors with organized and valuable information by collecting data from various sources and generating it in a structured and consistent manner for users. With the rise of artificial intelligence tools, scientific research and information retrieval have become increasingly dependent on these technologies, despite challenges such as the credibility of information, proper documentation, and other associated issues. AI tools have also emerged as a threat to many professions, including teaching and scientific research. Although AI poses challenges to the human mind, the human intellect—being the creator of these tools—remains irreplaceable and enduring. To mitigate the impact of AI tools and enhance students' self-communication skills by relying on their abilities and experiences in English language communication, this research aims to identify strategies and techniques that assist students in generating ideas and using them effectively. A review of literature over the past two years, including studies by Dewi et al. (2020), Klingenberg et al. (2020), Makransky et al. (2021), Ponce et al. (2020), Buchner (2022), Muhammad & Albanaa (2023), and Tian et al. (2023), revealed that generative learning strategies—upon which the concept of AI tools for idea generation is based—are the most effective in enhancing communication skills and developing productive thinking skills in English language among university students.

The Aims

This study aims to reveal:

1- The difference between the students' achievement in both groups.
2- The difference between the male and the female students' scores in the achievement test.
3- Students' preference of certain generative learning strategies.

The Hypothesis

This study aims to reveal the following hypotheses:

1- There is a significance difference at (α= 0.05) between the students' productive thinking skills in the experimental group and control group due to teaching methods.
2- There is a significance difference at (α= 0.05) between the male and the female students' productive thinking skills achievement in the experimental group due to learning via generative learning strategies.
3- Students prefer certain generative learning strategies over others for developing productive thinking skills.

Significance of the Study

This study is significant for all English language school teachers and university instructors as it highlights the role of using mapping techniques, self-explanation, self-testing strategies, summarizing, teaching methods, enacting activities, drawing, and imagining techniques in developing students' speaking and writing skills. Additionally, the study serves as a valuable indicator of the benefits of training students to use generative learning strategies instead of relying on artificial intelligence tools. Generative learning strategies help students learn in an authentic context, fostering skills that endure throughout their lives.

The Limits

The outcomes of the study are limited to the following:

1- **The Participants:** The participants are 57 male and female students from 2nd grade.

2- **Location:** The study was conducted at the Department of English, College of Arts, University of Anbar.

3- **Duration:** The study was conducted during the weeks 10, 11, and 12 of second semester of the academic year 2023-24.

Literature Review

Active student participation in learning is rooted in the principle of generative learning (Wittrock, 1974). Generative learning is characterized by the use of prior knowledge to understand new information. A key aspect of generative learning is the ability of students to apply new knowledge within the context of a concept by organizing prior knowledge to generate new insights (Fiorella and Mayer, 2016).

Brod (2021) proved that generative learning strategies are suitable for students at university level, but not all these strategies are suitable for students at schools level, the strategies that the students can use between ages 8 to 12 years are different from the students between 13 to 17 years old. The effectiveness of the generative learning strategies are based on educational levels.

A teaching strategy is one of the generative learning strategies. Some language features require a specialized learning program, especially homophones in the English language, which often confuse EFL learners due to their nature. Homophones are words that are pronounced the same but have different spellings, such as 'allowed' and 'aloud.' Jameel (2023a) investigated the effect of a 'Homophones Spelling Program' on students' productive skills. The participants were from three universities in three different countries, and the findings revealed that the program improved students' spelling and pronunciation achievements.

Furthermore, self-explaining is another generative learning strategy in which a student monitors his or her actions, such as pronunciation, spelling, learning attention span, etc. Jameel (2023b) found that self-monitoring

strategies have developed EFL students' speaking skills and increased their awareness of self-learning.

To generate ideas and arrange them coherently and cohesively to provide a comprehensive picture, it is advisable to use the 'Mind Mapping' strategy (Jameel, et al., 2024). This strategy helps students generate a main idea and connect it with sub-ideas that explain, demonstrate, or support the main idea, ensuring each paragraph has a main idea supported by sub-ideas. The strategy is based on a diagram that aids learners in composing a written text (Buzan, 2024). Jameel (2022) investigated the effect of story mapping on students' writing achievement, and the results revealed that students were able to write creative texts in the English language.

Note-taking is a skill that helps students comprehend spoken content and record it in an organized manner. As one of the key learning methods, note-taking can significantly enhance learners' understanding. It is a crucial generative learning strategy that enables students to obtain and retrieve information systematically, thereby stimulating both listening and writing skills (Salame & Thompson, 2020). Moreover, it encourages students to generate ideas based on prior knowledge by reformulating new information in their own style, thus enhancing learning and understanding through active participation (Bohay et al., 2011). Note-taking stimulates cognitive processing of information and helps assign meaning to data (Boyle, 2011). However, taking notes without assessing the relevance of the information can hinder the learning process. It does not facilitate idea generation but merely reformulates the content in a different style, which negatively impacts effective learning (Wood & Moss, 2024).

Previous Studies

Brod (2021) investigated the which age is suitable to use generative learning strategies: concept mapping, explaining, predicting, questioning, testing, and drawing for students' ages. The results revealed all generative learning strategies are effective for students at the level of university. Whereas predicting and practice testing strategies were effective in intermediate school level, the rest: questioning and drawing strategies were effective for preparatory school level.

Ponce, et al. (2020) investigated the strategies (Note taking, Graphic Organizer, and Questioning) that enhance generative Learning. The participants were from 4th grade university students. A reading text, graphic organizer, questions strategy, note take strategy were used to collect the data. The results revealed that the students who taught via graphic organizer strategy and questioning strategy outperformed the comprehension test better than the students at the note taking strategy and reading strategy.

Methodology

The Participants

The participants were 57 male and female students from the second grade at the Department of English, College of Arts, University of Anbar. The participants were randomly divided into two groups using a list of names. Students were selected alternately, with the first name on the list assigned to the experimental group and the second name assigned to the control group. The study was conducted during the second semester of the academic year 2023-24. Table 1 shows the distribution of the participants.

Table 1: Participants of the study

Groups	Participants	Pilot sample	Total
Experimental	25	4	29
Control	25	3	28
Total	50	7	**57**

The Instruments

An instruction generative learning strategies based program, pretest, and posttest were prepared to collect the data. The validity and the reliability of the instruments were verified.

The Validity and The Reliability

The validity of the instructional program and the posttest were distributed to a jury members specialized in teaching English language and applied linguistics from the College of Education for Women and College of Arts at the University of Anbar and University of Baghdad. The jury member suggestions, and corrections were taken into consideration.

The reliability of the instructional program and the posttest were verified by using test- retest method within 10 days period. The re-test reliability was computed by using Pearson correlation between the two implementations of the tests, the internal consistency reliability values of the test was 0.91 and the values of the stability index were 0.84, which is considered a high reliability.

Pilot Sample

7 male and female students were excluded from the participants (from group A and Group B) to represent the pilot sample. The results of the pilot test revealed that the workability of the test and the clarity of its instructions, furthermore, the time required to answer the test need to be between 45-50 minutes.

The Results

Results Related to the First Hypothesis

To verify the first hypothesis "There is a significance difference at (α= 0.05) between the students' productive thinking skills in the experimental group and control group due to teaching methods", mean scores, standard deviations, and T-Test values were used. Table 2 shows the results of the participants' achievement in the pretest.

Table 2: Mean Scores, Standard Deviations, and T-Test Values of the Two Groups in the Pre-test

Groups	N.	Mean	St.D	Df	Calculated T-value	Tabulated T-value	sig.
Control	25	7.28	0.89	23	0.91	2.000	0.05
Experimental	25	7.25	0.84				

Table 2 showed that the mean scores of the control group were (7.28) with a standard deviation (0,89), whereas the mean scores of the experimental group were (7,25) with a standard deviation (0,84). The calculated t-value was (0,91), which was lower than the tabulated value (2.000), at the degree of freedom (23), and at (0.05) level of significance. This result indicated that there was no significant difference between the two groups.

The participants' achievement in the posttest was calculated via mean scores, standard deviations, and T-Test values, table 3 shows the results.

Table 3: mean scores, standard deviations and T-test of the two groups in the post-test

Groups	N	Mean	St.D	Df	Calculated T-value	Tabulated T-value	sig.

Experimental	25	14.38	1.28	23	8.90	2.000	significant
Control	25	11.27	11.27				

Table 3 shows that the mean scores of the experimental group were (14.38) with a standard deviation (1,28), whereas the mean scores of the control group were (11.27), and a standard deviation was (1,19) on (23) degrees of freedom. The calculated t- value was (8,90) which is more than the tabulated t- value (2,000) on significance (0,05). This result indicates that the two groups are not equivalent in the posttest. This means that the first hypothesis is accepted.

Results Related to the Second Hypothesis

To verify the second hypothesis " There is a significance difference at (α= 0.05) between the male and the female students' productive thinking skills achievement in the experimental group due to learning via generative learning strategies", mean scores, standard deviations, and T-Test values were used. Table 4 shows the results of the participants' achievement in the pretest.

Table 4: Mean Scores, Standard Deviations, and T-Test Values of the male and female students in the Pre-test

Gender	N.	Mean	St.D	Df	Calculated T-value	Tabulated T-value	sig.
Male	8	13.74	1.20	23	0.47	2.000	0.05
Female	17	13.51	1.25				

Table 4 shows that the males mean score is 13.74 with standard deviation 1.20, while the females mean score is 13.51 with standard deviation 1.25, while the calculated t-value is 0.47 which is lower than the tabulated t-value, this indicates that there is no significant difference between the male and female score in the achievement test. This result indicates that the males and the

females are equivalent in the posttest. This means that the second hypothesis is rejected.

Results Related to the Third Hypothesis

To verify the third hypothesis "Students prefer certain generative learning strategies over others for developing productive thinking skills", the most commonly used strategies by students to answer the post-test questions were calculated, and the most common strategies were as follows (arranged from most commonly used to least): mapping, self-explaining, self-testing, summarizing, teaching, enacting, drawing, and imagining.

Discussion of the Results

The results revealed that there was a positive significance of using generative learning strategies in improving productive skills. This means that the feature of the strategies helped students to improve their writing and speaking skills. Mapping strategy features such as visual presentation, the derivation of the topic from center (the main idea) to sub-topics (related to the main topic), the smooth connections among the ideas, quick students memory retention (by remembering the diagram of the topic), by designing the map, the students engaged in dynamic learning (active learning), enhance student's creativity (create the map by generating ideas and connect them together), and also provide facilitation for the complex relationships. These features helped students to generate ideas and be able to communicate successfully.

These results are consistent with the results of the studies of Fu, et al. (2019) and García-Peñalvo & Vázquez-Ingelmo (2023) who found that using mind-mapping has positive effect on enhancing students productive skills.

The results also found that self-explaining, self-testing, summarizing, teaching, enacting, drawing, and imagining strategies have positive effect on improving students' productive skills. Self-explaining enable students to connect the previous information to generate new knowledge. Also, help students to correct their mistakes and errors. Furthermore, the self-testing strategy has enabled students to reflect on their learning, evaluate their level, and measure their progress. In addition, the summarizing strategy has enhanced students' memorization and creative thinking because it allows them to generate information in their own style and focus on the main ideas only. This strategy also enables students to write cohesive and coherent texts. The teaching strategy has a significant effect on students' productive skills, improving their ability to explain, convey information clearly, increase motivation, and take calculated risks. Enacting strategy has also been used by the students which has significant effect on their productive skills, this skills promote students' engagement in authentic context, exchange role play, and creating learning style. Drawing strategy has positive role that train students to shift the information to visual materials. Visual materials are ease to understand and can be recalled quickly. The imagining strategy was used in limited way because it needs deep thinking and consumes time to connect a vocabulary to an object such as the idiom "fat cat" which means "rich".

These results are consistent with the results of the studies of Yang & Wang (2021), Fiorella (2023), Konotop, et al. (2023), and Tushingham & Rainbow (2024) who found that self-explaining, self-testing, summarizing, teaching, enacting, drawing, and imagining strategies have significant effect on students' language skills.

The study also found that there was no significance between the male and female students achievement. This may due that the generative learning

strategies can be used by male and female students without any distinguishing. The features of these strategies do not need any special gender efforts.

Conclusion

It can be inferred that generative learning strategies have many positive effect on students productive and receptive skills, the strategy also have positive effect on students' affective and psychomotor domains in addition to the cognitive domain. The strategies also played good role to enhance students' motivation, risk-taking, creative thinking, and also thinking skills. also, students preferred strategies that provided more positive facilitation compared to others in enhancing their productive thinking skills. The selection of strategies was influenced by factors such as ease of use, usefulness, and those that saved time and effort for the students.

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