Journal of Humanities and Social Sciences Studies
ISSN: 2663-7197
DOI: 10.32996/jhsss
Journal Homepage: www.al-kindipublisher.com/index.php/jhsss

JHSSS
AL-KINDI CENTER FOR RESEARCH AND DEVELOPMENT

| RESEARCH ARTICLE

The Effectiveness of the Generative Learning Strategy in Developing Productive Thinking Skills in English among Ninth-Grade Female Students

Dr. Sahar Mousa Abdel Alrahaman AlRahahleh
Corresponding Author: Dr: Sahar mousa abdel alrahaman AlRahahleh, **E-mail**: saharmousara@yahoo.com

| ABSTRACT
This study aimed to determine the effectiveness of the generative learning strategy in developing productive thinking in English among ninth-grade female students. The quasi-experimental approach was used. The study sample consisted of (30) ninth-grade female students at Umm Al-Amad Mixed Basic School in the Salt District Directorate during the second semester of the 2024/2025 academic year. The experimental group consisted of (15) students, and the control group consisted of (15) students. A test to measure productive thinking skills was administered to them, consisting of (24) questions distributed across (8) domains. The test's validity and reliability were verified, and a teacher's guide was prepared to teach a unit using the generative learning strategy. The study results showed a statistically significant effect at the significance level (a = 0.05) of the generative learning strategy on developing general productive thinking skills. In light of the results, the study recommended the need to hold training courses for English language teachers to familiarize them with modern teaching strategies, including the generative learning strategy.

| KEYWORDS

Generative learning, productive thinking skills

| ARTICLE INFORMATION

ACCEPTED: 19 August 2025 **PUBLISHED:** 21 September 2025 **DOI:** 10.32996/jhsss.2025.7.9.8

1. Introduction

Language has been one of the most prominent tools of communication between humans since ancient times. With the development of human societies, different languages have become a primary means of understanding and exchanging ideas. Among these languages, English stands out as a global communication tool, its use becoming almost universal in many fields, whether in education, science, or business. Over the past two centuries, English has become an indispensable language in most global achievements, which are first written down in it and then translated into other languages (Konar, 2011). This widespread use has made English a primary foundation for knowledge transfer, including in the oral sphere, which contributes significantly to the development of individuals' communication skills.

In education, English plays a pivotal role in knowledge acquisition at the oral level, as oral language skills are responses resulting from human interaction in diverse linguistic contexts. These skills are considered among the most important factors contributing to the development of thinking and the development of social communication abilities (Konar, 2011). Hence, teaching English as a second language has become a top priority in contemporary education. Teaching this language requires additional efforts from teachers, who must be fully aware of modern language teaching strategies and methods to maximize the benefits of this language in various contexts.

In this context, the traditional role of the teacher has evolved significantly, with the teacher becoming not just a lecturer, but a participant and facilitator. This shift requires the teacher to be fully aware of modern English language teaching strategies,

enhancing their practical abilities and making the teaching process more effective. This, in turn, contributes to improving student performance, enabling them to learn the language in a way that suits their individual needs and makes them more capable of interacting with it in their daily lives (Romiszowski, 1981).

Furthermore, productive thinking has become one of the most important skills students must acquire in this era, as it helps them to deeply understand the world and make logical and informed decisions. Productive thinking requires active intervention from both the teacher and the student, as the teacher must carefully plan to motivate students to think critically and creatively. This type of thinking not only helps students understand academic topics, but also enhances their ability to generate new knowledge that contributes to solving contemporary problems (Romiszowski, 1981; Sada, 2015).

Regarding the development of thinking skills in English, modern teaching strategies such as generative learning, which is based on cognitive theory, stand out. This strategy, which includes summarization, self-questioning, and self-explanation, helps students connect new information to prior knowledge, enhancing their understanding and promoting critical thinking (Fiorella & Mayer, 2015). This strategy is based on the idea that knowledge construction is an active process that requires student interaction, whereby old and new knowledge are integrated to form a deep and integrated understanding (Wittrock, 1974).

1.1 Study problem

The problem of the study is the poor productive thinking skills of English language learners across different educational levels. Hashisho's (2009) study showed that Jordanian students' communicative competence in public schools is significantly low, causing frustration and affecting their ability to express themselves and interact effectively. Al-Jasmi's (2022) study also highlighted the important role the teacher plays in motivating and effectively guiding students in the classroom, as active engagement with knowledge and linking old and new concepts are essential for building deep understanding.

In this context, this study seeks to determine the extent to which teaching methods affect the development of learners' productive thinking skills, particularly by comparing the impact of generative learning strategies with traditional teaching methods. Previous studies have demonstrated the importance of modern teaching strategies such as generative learning in promoting critical and creative thinking. Fiorla and Meyer (2015) also demonstrated that activities associated with generative learning, such as summarizing, drawing, and mapping, significantly contribute to developing students' thinking skills, enhancing their ability to better absorb and analyze information.

Hence, this study seeks to answer the following main question: Are there statistically significant differences at the significance level ($\alpha = 0.05$) between the averages of students in the experimental and control groups in developing productive thinking skills, attributable to the teaching method (generative learning strategy versus the traditional method)?

1.2 Study Objectives

The study aims to:

- To find out the existence of statistically significant differences at the significance level ($\alpha = 0.05$) between the averages of the students of the experimental and control groups in developing productive thinking skills attributed to the teaching method (generative learning strategy, traditional method)

1.3 *Importance of the study*

The study "The Effectiveness of the Generative Learning Strategy in Developing the Productive Thinking Skills of Ninth-Grade Female Students in English" is of great scientific and practical importance. From a scientific perspective, this study contributes to enriching the educational literature related to developing students' thinking skills, particularly in the field of foreign language learning. The study focuses on innovative teaching strategies, such as the generative learning strategy, which is considered one of the most prominent modern methods that support the development of critical and creative thinking in learners. It also highlights the impact of these strategies in enhancing the ability to think productively, which is one of the most important cognitive skills students need to meet the challenges of modern learning.

From a practical perspective, this study offers effective solutions to the problems facing teachers in developing students' thinking skills in the early stages of education, particularly in English. By implementing the generative learning strategy, teachers can provide an interactive learning environment that contributes to motivating students to think critically and creatively,

enhancing their ability to understand and analyze texts more deeply. The study's results may also contribute to the development of curricula and teaching methods that reflect students' cognitive needs and enhance the effectiveness of the educational process in schools.

1.4 *Study Limitations and Determinations*

The study was limited to ninth-grade female students at Umm Al-Amad Mixed Basic School, affiliated with the Salt Education Directorate, during the second semester of the 2024/2025 academic year. The results are determined by the validity and reliability of the study instrument.

1.5 *Study terms and their operational definitions*

- Generative Learning: Osborne and Wittrock (1985) defined generative learning as a model of education in which learners actively participate in the learning and meaning-building processes based on their prior knowledge and experience. Afana and Al-Jish (2008: 239) defined it as "linking the learner's prior experiences to their subsequent experiences, developing and forming relationships between them, such that the learner constructs generative processes that he uses to modify alternative perceptions and incorrect events, in light of correct scientific knowledge."
- Productive Thinking: Attia (2015) defined it as a mental process in which sensory perception interacts with experience, requiring a set of skills and abilities to be employed in searching for and discovering new relationships, or to achieve a specific goal driven by internal or external motivations, or both. It is operationally defined as thinking that combines critical and creative thinking skills, which results in new perceptions and uses of the new concept, and is measured by a productive thinking skills test prepared for the purposes of the current study.

2. Theoretical Framework

There is no doubt that language is one of the primary tools of communication in all societies. It enables individuals to interact with one another to express their feelings and questions. Language learning has emerged as an essential tool for mastering the language of communication and helping individuals understand its various characteristics and rules.

The world's languages have varied and multiplied, and their importance has varied from religious and political perspectives. Perhaps the most important language is English, which has become widespread in most countries around the world. It is the first language in many of these countries and the second language in others. It can be said that it is the most widely spoken language in the world, and what increases its importance in the information age we live in is that it is an important language for online communication, in addition to being the language of scientific research and educational materials. It is imperative to keep pace with scientific progress and pay attention to learning this language and its four skills: listening, speaking, reading, and writing (Al-Hayat, 2019).

The English language is currently one of the most important contemporary languages, so learning and mastering it has become an urgent need, required by the circumstances of the era in which we live. Because people in this era recognize the importance of the English language and the need to learn it, as it is an international language understood and used by most people, this is confirmed by the increasing number of English language schools and institutes spread around the world. The intense competition among these educational institutions in their efforts to attract those who wish to learn English and master its skills demonstrates the effectiveness of the language programs they offer to their students, the level of qualification of their teachers assigned to teach it to those who wish, the innovative methods they employ to assist in teaching it, and everything else that contributes to making the process of learning it easy and accessible to all who desire it (Wagner & Urhahne, 2021).

English is the second official language in Jordan, and the Ministry of Education has worked tirelessly to develop its teaching. As part of these efforts, the General Framework for Curricula and Evaluation, issued in 2013, was implemented to prepare English language curricula and develop teaching strategies. Among the most prominent features of the general framework for developing English language curricula is the preparation of general outcomes for teaching English. These outcomes guide the learning of learners, who are the focus of the learning and teaching process. The general framework for English language curricula also includes the development of teaching methods and assessment techniques, in addition to training learners in self-assessment. The Ministry of Education has also paid great attention to the use of modern teaching strategies in developing the teaching and learning process (Irshid, 2022).

The importance of learning English for students lies in listening to and understanding simple English, enabling learners to express themselves orally using this simple language, reading and understanding written English topics in simple language, writing simple sentences in English, and realizing the importance of English as a global language of communication and interaction. This helps present Islamic and Arab civilizations and the cultural achievements of Muslims to other nations, and also helps them understand the importance of the English language in benefiting from the achievements of other cultures, in accordance with religion, customs, and traditions (Mufleh, 2021).

Today's world is increasingly turning to English language teaching. Every country in the world includes English as a second language in its curricula, taught alongside its mother tongue. English is also the common language in engineering, medicine, and other sciences, and modern scientific articles and books are published in this language (Turki and Ghanem, 2019). Innovation and modernization in the methods and strategies for teaching a second (foreign) language are directly required of the teacher. The success of these methods depends on their proper use, which can be enriched with experience and training. This can be achieved through the use of a data show or a device that facilitates the presentation of video and audio tapes. This device brings the idea closer to the learner's mind through images, and the teacher, with his intelligence and capabilities, enables him to manage the lesson with sufficient and comprehensive explanations, enabling him to successfully accomplish his mission. The teacher also follows important methods for conducting specific dialogues, avoiding raising numerous complex questions. Rather, five questions and five rich answers are sufficient, written with consideration for the context of the lesson. Learners are encouraged to take turns, which solidifies the information in the mind and builds confidence. As for writing, it is not necessary to ask the learner to edit or rewrite an entire paragraph. Rather, short, easy sentences, consisting of a verb, a subject, and an object, are recommended. The teacher's resorting to this exercise demonstrates their shrewdness and intelligence. Writing is a weapon for the learner in their studies, careers, and personal lives, and resorting to it is a way to consolidate ideas and information in their minds. Nevertheless, expression, both oral and written, are essential elements in learning a foreign language. Such methods help achieve the goal more quickly and effectively, which is required for greater and broader language acquisition (Tabash, 2021).

2.1 Generative Learning Strategy

Several strategies have emerged whose philosophy is based on employing a constructivist approach to learning, including the learning cycle model, the V-shaped map, the conceptual change model, the constructivist analysis model, the realistic model, and the generative model. The generative model is one of the modern teaching and learning models based on the ideas of constructivist philosophy. These models are defined as a set of diagrams that outline the stages and steps of learning in light of the foundations and assumptions of constructivist theory (Al-Jasmi, 2022).

The generative learning strategy is based on the mental processes that occur within the brain during conceptual learning and problem-solving, which the learner may encounter in their daily lives. It is thus generated when the teacher uses cognitive and metacognitive strategies to enable the learner to achieve meaningful learning by linking previous experiences to new knowledge (Duhair, 2009). In the generative learning strategy, the learner builds knowledge through generative processes that he or she uses to modify alternative perceptions and incorrect events in light of their existing knowledge (Al-Jasmi, 2022). The generative learning strategy is a professional development model in which knowledge is constructed based on learners' prior knowledge and experiences within a sociocultural context between learners and between learners and teachers (Ibrahim, Sanji, Ali, Abdel-Maksoud, & El-Sayed, 2021). The model is built in light of social constructivist ideas and consists of four learning stages: introductory, focused, challenged, and applied. It aims to help learners generate information, knowledge, and ideas by establishing relationships between previous and new information, and between new pieces of information (Abdel-Rahim, 2020). The generative learning strategy is a functional model of learning that aims to equip learners with the ability to generate two types of relationships: the first: generating relationships between the learner's prior and subsequent experiences, and the second: generating relationships between the pieces of knowledge or subsequent experiences to be acquired (Jabr, 2019). In conclusion, this strategy is a model employed by teachers to teach learners, enabling them to generate connections between the learner's prior experience and new information, as well as connections between the new information the learner is working to acquire. Generative learning emphasizes the importance of social interaction for learning, the purpose of which is rational intellectual development. Meaning is constructed through active and continuous learning. Knowledge in generative learning is constructed between the teacher, the student, and the learners themselves, based on the premise that knowledge is a social process that guides learners' thinking, helps them construct meaning, and is greatly influenced by the ideas present in the

learner's structure and the connections that arise between the stimuli they are exposed to, to form new ideas and knowledge (Akin, Lynn, 2017).

Generative learning goes through five educational phases and stages:

1. The introductory phase: In this phase, the teacher prepares the lesson through dialogic discussion and questioning. Learners then respond, and language between teacher and students becomes a psychological tool for thinking, speaking, seeing, and acting. In this phase, learners' concepts become clear through language, writing, and action. The focus is on individual reflection on the concept. This involves identifying learners' ideas, identifying their prior concepts, reflecting on their thinking through dialogue with all learners, and then identifying incorrect concepts that may hinder new concepts (Mansoor, Zahran, & Ahmed, 2018).
2. Focus Phase (Focus): In this phase, the teacher divides learners into small cooperative groups to perform activities under the teacher's guidance. The learners' work is focused on the targeted concepts, while introducing scientific concepts and terminology. This helps them connect their prior knowledge with the new knowledge presented to them, and provides opportunities for dialogue and discussion between the groups. This increases learners' motivation to explore by asking them questions and giving them the opportunity to observe, express, infer, and interpret, as well as to share and interact socially. This helps generate relationships between new concepts and information stored in long-term memory. The teacher and their students then arrive at a shared meaning and understanding of the information or concepts to be presented. Here, learners experience the concept (Pratomo, 2017).
3. Contrasting Phase (Challenge): In this phase, the teacher engages all learners in a group discussion, observes their activities, assists them with appropriate educational materials and tools, and provides an opportunity to express their observations and understanding. This is followed by reintroducing the scientific terms, information, and concepts generated from the previous phase, challenging what the learner knew in the introductory phase with what they learned during their learning (Rahayu, Masrukhan, & Sugianto, 2019).
4. Application Phase: In this phase, scientific concepts are used as functional tools to solve scientific problems and arrive at results that can be used in new real-life situations. This helps expand the scope of the concept. The teacher provides students with appropriate time and new situations to apply what they have learned and discuss it with each other. Thus, everything the student has learned becomes part of their values and behaviors (Russell & Leslie, 2016). 5. Evaluation Phase: Evaluation is an important component of the educational process. It helps assess what has been achieved, guide learners to identify and enhance their strengths, and address their weaknesses (Smith, Cowiem & Blades, 2015).

The basic features of the generative learning strategy are that learners' existing ideas influence their use of their senses. Therefore, they use the ideas present in their cognitive structure to effectively test tangible inputs. The tangible input that the student selects and engages with does not have a specific meaning in itself; rather, they need to be aware that meaning is something the create themselves, not something the teacher places in their mind (Al-Shammari, 2018).

The generative learning strategy has four components that can be used individually or in combination: recall, integration, organization, and elaboration. Recall is the retrieval of information from the student's long-term memory. The goal of recall is for the student to learn fact-based information. In integration, learners integrate new knowledge with prior knowledge. The goal of integration is to transform information in a way that makes it more easily remembered. There is organization, in which prior knowledge is linked to new ideas in meaningful ways. Elaboration involves connecting new material to existing information in the student's mind. The goal of expansion is to add ideas to the new information (Abdul Hamid, 2015).

2.1.1 Productive Thinking

Thinking has received the attention of many scholars and educators in this era characterized by development and progress in various fields. Therefore, thinking has taken a leading role in the progress and prosperity of this era. Here, it has become imperative to develop students' thinking skills by stimulating their minds with these skills and practicing them. In the early stages of human thinking, humans relied on their senses without attempting to perceive the relationships between the phenomena that occurred, understand them, and connect them to each other to arrive at the truth of their occurrence and the causes of this occurrence. Historically, it is noted that Plato was the first to address the subject of thinking and the analytical and synthetic methods in his mathematical discussions with his students. Socrates, who preceded Plato, addressed the process of thinking through logical inference, which helped develop knowledge and the means of acquiring it, particularly in the areas of inductive, deductive, and critical thinking. Aristotle believed that logical thinking is the correct path to thinking (Al-Tamimi, 2016). Thinking is a mental process in which sensory perception interacts with experience and intelligence to achieve a goal and outcome. Thinking only occurs when there is a motivation that drives a person to think (Ashqar and Al-Khatib, 2019). Thinking is also a

mental function and a cognitive process that occurs at the highest mental levels. This level produces coordinated and systematic knowledge through symbolic processes, using reasoning, memory, imagination, and visualization (Al-Omariya, 2015). Productive thinking, to begin with, is a combination of creative and critical thinking skills. Thinking of any kind is productive as long as it is a mental process that occurs through experience, resulting in meaningful action (Beyer, 2013). Therefore, productive thinking is an active process that evolves through multiple activities leading to problem-solving. It takes the form of an ongoing internal dialogue that occurs during experience, such as doing something, paying attention to a scene, or expressing one's point of view (Saada, 2014). Productive thinking is also a tool that combines creative and critical thinking to perform tasks and solve problems with high quality (Sulaiman, 2021). Productive thinking is the learner's ability to employ creative and critical thinking skills while solving problems, to arrive at a new product, accomplish tasks, or generate ideas in unconventional, more positive ways. This involves offering solutions characterized by fluency and flexibility, as well as the ability to critique and evaluate these solutions (Abdel Fattah, 2021). It is also a mental process aimed at creating something new, using the ability to implement complex thinking processes in an attempt to solve the problem at hand (Murtianto, et al., 2019). Productive thinking skills are divided into two categories: creative thinking skills and critical thinking skills. Redifer and Zhao (2021) identified creative thinking skills as follows:

1. Fluency: The ability to generate a large number of alternatives, synonyms, ideas, problems, or uses in response to a specific stimulus, and the speed and ease of generating these. It is essentially the process of remembering and voluntarily recalling previously learned information, experiences, or concepts. Fluency takes many forms: verbal fluency, which is the individual's ability to produce the largest number of words and vocabulary in a given time; and intellectual fluency, which is the production of a large quantity of ideas.
2. Flexibility: The ability to generate diverse ideas that are not typically expected, and to direct or shift the course of thought as the stimulus or situational requirements change. Flexibility is the opposite of mental rigidity, which means adopting predetermined mental patterns that are not subject to change as needed.
3. Originality: This refers to novelty and uniqueness. It is the common factor among most definitions that focus on creative outputs as a criterion for judging the level of creativity. It refers to the ability to find unusual solutions that stem from the framework of an individual's own experience. 4. Elaboration: This refers to the ability to add new and varied details to an idea, a solution to a problem, or a picture that would help develop, enrich, and implement the idea.
4. Sensitivity to problems: This refers to awareness of the existence of problems, needs, or weaknesses in the environment or situation. This means that some individuals are quicker than others to notice a problem and verify its presence in a situation. There is no doubt that discovering a problem represents the first step in the process of finding a solution, and then adding new knowledge or introducing improvements and modifications to existing knowledge or products. This ability is linked to noticing unusual, anomalous, or confusing things in one's surroundings, repurposing or using them, and raising questions about them, such as, "Why hasn't anyone taken action?" As for critical thinking skills, Yildiz and Yildiz (2021) identified them as follows:

1. The skill of predicting assumptions, which is the ability to identify assumptions that are suitable as a solution to a problem or an opinion on the issue at hand.
2. The skill of interpretation, which is the ability to draw a specific conclusion from assumed facts with a reasonable degree of certainty.
3. The skill of evaluating arguments, which is the ability to distinguish between the general strengths and weaknesses of arguments, provide justifications, and draw a conclusion in light of the existing facts that are acceptable to reason.
4. The skill of deduction, which is the ability to recognize the relationships between given facts, such that one can judge, based on this knowledge, whether a conclusion is fully derived from these facts or not, regardless of the validity of the given facts or one's position on them.
5. The skill of inference, which is the mental ability in which one uses our knowledge and skills to distinguish between the degrees of validity or falsity of a conclusion, depending on the degree of assumptions that are suitable as a solution to a problem or an opinion on the issue. The learner's role is to think productively by participating in classroom activities, justifying their answers and providing evidence to support them, thinking when a problem arises or a situation arises, asking questions without getting bored, searching for multiple possible solutions to the problem, focusing their attention on the problem and not being easily distracted, listening carefully to what their classmates say, self-reflection, reflecting on what they have done or said, monitoring their actions, and discussing complex and difficult questions about the topic (Yildiz and Yildiz. 2021)

3. Previous studies

Othman (2022) conducted a study titled "The Effectiveness of the Generative Model in Teaching English Synonyms and Antonyms to Second-Year Secondary School Girls in Bisha Governorate, Saudi Arabia." The researcher adopted a quasi-experimental approach to test the impact of generative learning on teaching the experimental group. The study found a statistically significant effect attributed to the generative learning model. The study recommended the importance of using the generative learning model in teaching English, given its proven effectiveness in teaching synonyms and antonyms. Al-Sharif (2020) conducted a study titled "The Effectiveness of Using the Generative Learning Model in Teaching English to Develop Creative Writing Skills among Third-Year Secondary School Students." The study aimed to investigate the impact of the generative learning strategy on developing creative writing skills in English. The researcher used a quasi-experimental approach. The research sample consisted of third-year secondary school students, and the number of study members reached (72) students. The study concluded that there was a statistically significant effect of the generative learning strategy in developing general and specific skills of creative writing, in favor of the students of the experimental group, compared to the students of the control group. Al-Hajjah (2020) conducted a study titled "The Effect of Using the Generative Learning Model on Developing Some English Reading Skills among Middle School Students." The researcher used a quasi-experimental approach, using a sample of 68 students, divided into two groups: one taught using the traditional method, and the other taught using the generative learning model. The results of the study revealed a positive impact on the development of reading skills in English among members of the experimental group.

Al-Otaibi's study (2020) aimed to identify the effectiveness of integrated generative learning strategies and concept maps in developing grammatical skills among third-grade middle school students in Taif Governorate. The researcher used the quasi-experimental approach on the study sample consisting of (58) students divided into two groups. The researcher used the following tools: a grammatical skills list and a grammatical skills test. The study concluded that there are statistically significant differences in the level of understanding and interpretation attributed to the generative learning strategy and concept maps in developing grammatical skills. The current study is similar to this study. In terms of the mechanism for integrating the generative learning strategy with another strategy and testing it in language teaching.

Al-Alyan (2022) conducted a study aimed at exploring the impact of a developed curriculum based on brain-based learning strategies on developing productive thinking in mathematics among second-grade middle school students. The study followed a quasi-experimental approach, and the researcher used a productive thinking test in mathematics in the "Relative Numbers" unit. The study sample consisted of (37) female second-grade middle school students at Dar Al-Bara'a Private Middle School, randomly divided into two classes. One class represented the experimental group, comprising (19) students, and the other represented the control group, comprising (18) students. The results of the study revealed statistically significant differences at the (0.05) level between the average scores of students in the experimental and control groups in the post-test of productive thinking skills in mathematics, in favor of the experimental group, with a statistically significant effect size.

Sulaiman's study (2021) aimed to identify the effectiveness of some strategies based on cognitive load theory in developing productive thinking and self-regulation skills in science at the preparatory stage. To achieve the study objectives, the researcher prepared study materials and tools, including a teacher's guide, a productive thinking test in the skills of fluency, flexibility, prediction of hypotheses, deduction, interpretation, and evaluation of discussions, and a scale of self-regulation skills in science and its dimensions (self-monitoring, organizing and transforming information, time management, self-reward, managing learning resources, and environmental control). The study sample was randomly selected, consisting of 70 middle school students. They were divided into two groups: an experimental group, which studied the selected unit using strategies based on cognitive load, and a control group, which studied in the usual way, with 30 students in each group. After experimental treatment and testing the validity of the hypotheses, the study results showed that: The experimental group outperformed the control group in the productive thinking test as a whole and in its sub-dimensions. The experimental group outperformed the control group in the self-regulation skills scale as a whole and in its sub-dimensions. There is a positive correlation between the scores of the experimental group students in the productive thinking test and their scores in the self-regulation scale. The study of Abdel Fattah (2021) aimed to measure the effectiveness of integrating the scientific stations and idea gardens strategies in developing productive thinking and love of mathematics among middle school students. The research used the experimental method; the main research sample consisted of (76) first-year middle school students, divided into: an experimental group (n = 39) and a control group (n = 37). To achieve the research objectives, research materials and tools were prepared, namely: a teacher's guide, student worksheets, a productive thinking test in mathematics, and a love of mathematics scale. The research tools were applied pre- and post-tests to the control and experimental research groups. After the experimental treatment and

hypothesis testing, the results showed: students in the experimental group outperformed students in the control group in the productive thinking test in mathematics as a whole (and for each dimension of the test separately), and students in the experimental group also outperformed students in the control group in the love of mathematics scale as a whole (and for each dimension of the scale separately). Therefore, the research recommended the necessity of preparing training courses and workshops for mathematics teachers. To train them on how to teach using science stations, idea gardens, and how to combine them. Jenning and Lubiniski (1981) conducted a study aimed at identifying strategies used to improve the productive thinking of an adult with a language impairment. Two types of productive thinking were explored in this study: concept awareness and problem solving, a dynamic, creative process based on developing language comprehension. This study used a single-individual ABAB design and described the treatment techniques and interpretation methods for the Productive Thinking Scale in a 66-year-old man with moderate language impairment. The results indicated a significant increase in productive thinking in a variety of contexts.

3.1 Commentary on Previous Studies

There are numerous studies that have examined the impact of generative learning strategies on developing productive thinking skills. Many of these studies use a quasi-experimental approach to evaluate the effectiveness of the generative model in improving students' cognitive skills. For example, Othman's (2022) study demonstrated the effectiveness of the generative learning strategy in teaching synonyms and antonyms to second-year secondary school students, demonstrating that this strategy has a significant positive impact on enhancing creative and linguistic thinking. Al-Sharif's (2020) study also demonstrated that using this strategy in teaching creative writing skills to third-year secondary school students helped develop writing skills more effectively compared to traditional methods. These studies demonstrate similar results, confirming the effectiveness of the generative learning strategy in developing critical and productive thinking in various aspects of English language learning.

On the other hand, there are studies that have addressed productive thinking more broadly, such as Al-Alyan's (2022) and Suleiman's (2021) study, which focused on the impact of modern teaching strategies on developing productive thinking skills in mathematics and science. Although these studies differ in the targeted subjects (mathematics, science), they all emphasize the importance of incorporating modern teaching strategies such as generative learning or other cognitive-load-based strategies to promote productive thinking in students. Other studies, such as Gunning and Lubinski's (1981), examined the impact of productive thinking strategies on linguistically impaired adults, distinguishing them from studies on students at different grade levels in terms of their target group and educational context.

4. Study methodology and procedures

4.1 Study Methodology

A quasi-experimental approach was used for two groups: an experimental and a control group, given its suitability to the nature and purpose of the study.

4.2 Study Subjects

The study subjects consisted of ninth-grade female students at Umm Al-Amad Elementary School in the city of Salt, during the second semester of the 2021/2022 academic year. The study subjects were tested intentionally, thanks to the cooperation of the administration and teachers with the researcher, who works at the same school. The experimental and control groups were randomly selected. The experimental group studied using a self-questioning strategy, while the control group studied using the traditional method. The study sample consisted of (30) female students, distributed equally between the two groups, with (15) students in each group.

4.3 Study Tool

This study used the English Productive Thinking Test to measure the impact of the self-interrogation strategy on developing productive thinking skills. The productive thinking skills test was developed after reviewing the theoretical literature and previous relevant studies. The theoretical literature stated that creative thinking skills are: fluency in patterns, associations, and forms; flexibility in both spontaneous and adaptive forms; originality in the amount of unfamiliar responses; and selection of innovative titles (Al-Khalidi, 2013). Among the studies reviewed was the study by Marai and Nofal (2007). The test consisted of (24) questions, three of which were on each of: originality, fluency, flexibility, identifying assumptions, interpretation, deduction, inference, and evaluating arguments. Validity of the Productive Thinking Skills Test: To verify the validity of the Productive

Thinking Skills Test, it was presented to a group of judges from the curriculum and teaching specialization. The judges made minor modifications to the test, which remained composed of (24) questions, with three questions on each skill. The test was taken from the three creative thinking skills and critical thinking.

Reliability of the Productive Thinking Skills Test: To verify the reliability of the Productive Thinking Test, it was applied to a pilot sample from outside the study sample. A single class of ninth-grade students at Umm Juza Secondary School for Girls was selected. The test was administered twice to the same sample of (18) students, with a two-week interval between the two tests. Pearson's correlation coefficient was calculated for each of the productive thinking skills, as well as for the overall reliability of the skills. Reliability coefficients ranged between (0.69) and (0.79), with the overall reliability coefficient reaching (0.72). This indicates that these reliability values are appropriate for the purposes of the current study. The scientific material taught: The fifth unit "They have made important discoveries" from the English language book for the ninth grade was taught. The unit contains two lessons: Scott's race to the pole and The experience of life time, with ten periods for each lesson.

To answer this question, the arithmetic means and standard deviations of the scores of the individuals in the control and experimental groups on the general productive thinking skills test and its sub-dimensions were calculated in the pre- and post-tests. Table (1) illustrates this.

Table (1): Reliability coefficients using the test-retest method for the productive thinking test.

Skills	stability
Authenticity	**0.69**
Fluency	**0.69**
flexibility	**0.55**
Know the assumptions	**0.54**
Interpretation	**0.78**
deduction	**0.79**
Conclusion	**0.67**
Evaluation of arguments	**0.69**
kidney	**0.72**

It is clear from Table (1) that the stability coefficients came between (0.67) and (0.79), and the total stability coefficient reached (0.72), and this indicates that these stability values are appropriate for the purposes of the current study.

5. Study results and discussion.

The results of the first question, which reads: "Are there statistically significant differences at the significance level (α=0.05) between the averages of students in the experimental and control groups in developing productive thinking skills attributable to the teaching method (self-questioning strategy, traditional method)?"

Results related to the first question: The first question stated: Are there statistically significant differences at the significance level (α=0.05) between the means of the students in the experimental and control groups in developing productive thinking skills attributable to the teaching method (generative learning strategy, traditional method)? To answer this question, the arithmetic means and standard deviations of the scores of the members of the control and experimental groups on the general productive thinking skills test and its sub-dimensions were calculated in the pre- and post-tests. Table (2) illustrates this.

Table (2) Arithmetic means and standard deviations of the scores of the individuals in the control group and the experimental group on the general productive thinking skills test and its sub-dimensions in the pre- and post-tests.

Distance	The group	Dimensional measurement		Pre-measurement	
		standard deviation	arithmetic mean	standard deviation	arithmetic mean
Authenticity	empiricism	1.12	1.60	0.83	0.40
	The officer	0.46	0.73	0.49	0.33
Fluency	empiricism	0.77	1.20	0.63	0.60

	The officer	0.49	0.67	0.49	0.33
flexibility	empiricism	0.77	1.20	0.52	0.53
	The officer	0.52	0.47	0.51	0.40
Know the assumptions	empiricism	0.46	1.73	0.91	1.40
	The officer	0.99	1.13	0.94	0.80
Interpretation	empiricism	0.74	1.60	0.96	0.93
	The officer	0.94	0.80	0.64	0.87
deduction	empiricism	0.51	1.60	0.65	1.00
	The officer	0.80	0.93	0.77	0.80
Conclusion	empiricism	0.72	1.33	0.74	0.47
	The officer	0.46	0.73	0.82	0.67
Evaluation of arguments	empiricism	0.63	1.40	0.70	1.27
	The officer	0.77	0.80	0.88	1.07
Productive thinking test as a whole	empiricism	2.13	11.67	2.32	6.60
	The officer	2.02	6.27	1.49	5.27

It is clear from Table (2) that the arithmetic mean of the control group on the general productive thinking skills test in the pre-test was (5.27), while the arithmetic mean of the experimental group on the general productive thinking skills test in the pre-test was (6.60), and the post-test arithmetic mean of the control group became (6.27), while the post-test for the experimental group was (11.67), and this indicates the presence of apparent differences between the means of the control and experimental groups in the post-test, and the adjusted arithmetic means were extracted, as shown in Table (3).

Table (3) Results of the one-way analysis of variance (ANCOVA) on the post-test arithmetic mean of the study sample members' scores on the general productive thinking skills test according to the group variable.

Source of variance	**SS**	**df**	**MS**	**F value**	**sig.**	Eta square
The group	218.700	1	218.700	57.807*	0.000	**0.682**
accompanying tribal	1.118	1	1.118	1.789	0.375	**0.151**
error	102.149	27	3.783			
the total	2751.000	30				
Total corrected	338.967	29				

*Statistically significant at the significance level (α = 0.05)

From Table (8), it is clear that the (F) value related to the general productive thinking skills test reached (57.807), which is statistically significant at the significance level (α = 0.05). This means that there are statistically significant differences between the post-test scores of the two groups. Reviewing the adjusted arithmetic mean reveals that the differences are in favor of the experimental group. The post-test adjusted arithmetic means for the experimental group were higher than those for the control group, with the adjusted arithmetic mean for the experimental group reaching (11.67), while the adjusted arithmetic mean for the control group reached (6.27). This indicates a higher level of general productive thinking skills among the experimental group members after implementing the strategy. To determine the effect size of the strategy, Eta square was calculated, which reached (0.682), meaning that approximately (68.2%) of the variance in the study sample's performance on the post-test productive thinking skills is due to the strategy, while the remaining (31.8%) is due to unexplained factors. He also conducted a multivariate analysis of covariance (MANCOVA) on the post-arithmetic means of the study sample members' scores on the post-

productive thinking test dimensions, on the basis that the pre-scores are a common variable. Table (4) shows the results of this analysis.

Table (4) Results of a multivariate analysis of covariance (MANCOVA) for dependent variables, based on the post-test arithmetic means of the study sample members' scores on the dimensions of the productive thinking skills test.

Here is the translated version of the table in English:

Source	Dimension	Sum of Squares	Degrees of Freedom	Mean Squares	F	Statistical Significance	Eta Square
Group	Originality	5.633	1	5.633	10.817*	0.004	0.351
	Fluency	2.133	1	2.133	5.265*	0.033	0.208
	Flexibility	4.033	1	4.033	11.149*	0.003	0.358
	Recognizing Assumptions	2.700	1	2.700	5.624*	0.028	0.219
	Interpretation	4.800	1	4.800	6.059*	0.023	0.232
	Inference	3.333	1	3.333	8.420*	0.009	0.296
	Conclusion	2.700	1	2.700	9.207*	0.007	0.315
	Argument Evaluation	2.700	1	2.700	5.970*	0.024	0.230
Pre-test	Originality	2.145	1	2.145	4.118	0.056	0.171
	Fluency	0.121	1	0.121	0.300	0.590	0.015
	Flexibility	1.303	1	1.303	3.603	0.072	0.153
	Recognizing Assumptions	1.011	1	1.011	1.276	0.272	0.060
	Interpretation	0.093	1	0.093	0.118	0.735	0.006
	Inference	0.062	1	0.062	0.156	0.697	0.008
	Conclusion	0.069	1	0.069	0.234	0.634	0.012
	Argument Evaluation	0.041	1	0.041	0.090	0.767	0.004
Error	Originality	10.415	20	0.521			
	Fluency	8.104	20	0.405			
	Flexibility	7.235	20	0.362			
	Recognizing Assumptions	9.603	20	0.480			
	Interpretation	15.845	20	0.792			
	Inference	7.918	20	0.396			
	Conclusion	5.865	20	0.293			
	Argument Evaluation	9.046	20	0.452			
Total	Originality	67.000	30				
	Fluency	40.000	30				
	Flexibility	37.000	30				
	Recognizing Assumptions	81.000	30				
	Interpretation	68.000	30				
	Inference	64.000	30				
	Conclusion	45.000	30				
	Argument Evaluation	53.000	30				
Adjusted Total	Originality	26.167	29				
	Fluency	13.867	29				

	Flexibility	16.167	29				
	Recognizing Assumptions	19.367	29				
	Interpretation	24.800	29				
	Inference	15.867	29				
	Conclusion	12.967	29				
	Argument Evaluation	16.700	29				

*Statistically significant at the significance level (α=0.05).

Table (4) shows the presence of statistically significant differences in all sub-dimensions of the Productive Thinking Skills Test, namely:

- Originality Skill: The value of (F) was (10.817), which is statistically significant at the significance level (α=0.05), indicating an increase in the level of originality skill in favor of the experimental group. The adjusted arithmetic mean for the experimental group was (1.60), while the adjusted arithmetic mean for the control group was (0.73), as shown in Table (4). The value of partial eta square was (0.351), meaning that the program explained (35.1%) of the variance between the experimental and control groups in the scores on the originality skill.

- Fluency skill: The value of (F) (5.265) was statistically significant at the significance level (α=0.05), meaning that there was an increase in fluency in favor of the experimental group, as the value of the adjusted arithmetic mean for the experimental group was (1.20), while the value of the adjusted arithmetic mean for the control group was (0.67), as shown in Table (4). The value of the partial eta square was (0.208), meaning that the program explained (20.8%) of the variance between the experimental and control groups in the scores on the fluency skill. - Flexibility skill: The value of (F) (11.149) was statistically significant at the significance level (α=0.05), meaning that there was an increase in flexibility in favor of the experimental group, as the value of the adjusted arithmetic mean for the experimental group was (1.20), while the value of the adjusted arithmetic mean for the control group was (0.47), as shown in Table (7). Also, the value of the partial eta square was (0.358), meaning that the program explained (35.8%) of the variance between the experimental and control groups in the scores on the flexibility skill. - Assumption recognition skill: The value of (F) (5.624) was statistically significant at the significance level (α=0.05), meaning that there was an increase in assumption recognition in favor of the experimental group, as the adjusted arithmetic mean value for the experimental group was (1.73), while the adjusted arithmetic mean value for the control group was (1.13), as shown in Table (4). The value of partial eta square was (0.219), meaning that the program explained (21.9%) of the variance between the experimental and control groups in the scores on the assumption recognition skill. - Interpretation skill: The value of (F) (6.059) was statistically significant at the significance level (α=0.05), meaning that there was an increase in the level of interpretation skill in favor of the experimental group, as the value of the adjusted arithmetic mean for the experimental group was (1.60), while the value of the adjusted arithmetic mean for the control group was (0.80), as shown in Table (4). The value of the partial eta square was (0.232), meaning that the program explained (23.2%) of the variance between the experimental and control groups in the scores on the interpretation skill. - Deduction skill: The value of (F) (8.420) was statistically significant at the significance level (α=0.05), meaning that there was an increase in the level of deduction skill in favor of the experimental group, as the value of the adjusted arithmetic mean for the experimental group was (1.60), while the value of the adjusted arithmetic mean for the control group was (0.93), as shown in Table (4). The value of the partial eta square was (0.296), meaning that the program explained (29.6%) of the variance between the experimental and control groups in the scores on the deduction skill. - Deduction skill: The value of (F) (9.207) was statistically significant at the significance level (α=0.05), meaning that there was an increase in the level of deduction skill in favor of the experimental group, as the value of the adjusted arithmetic mean for the experimental group was (1.33), while the value of the adjusted arithmetic mean for the control group was (0.73). The value of the partial eta square was (0.315), meaning that the program explained (31.5%) of the variance between the experimental and control groups in the scores on the deduction skill. - Argument evaluation skill: The value of (F) (5.970) is statistically significant at the significance level (α=0.05), meaning that there is an increase in the level of argument evaluation skill in favor of the experimental group, as the value of the adjusted arithmetic mean for the experimental group was (1.40), while the value of the adjusted arithmetic mean for the control group was (0.80), and the value of the partial eta square was (0.230), meaning that the program explained (23.0%) of the variance between the experimental and control groups in the scores on the argument evaluation skill.

The study results showed statistically significant differences at the significance level (α=0.05) between the means of the students in the experimental and control groups in developing productive thinking skills, attributed to the teaching method (generative learning strategy versus traditional method). These differences were in favor of the experimental group, indicating a positive impact of the generative learning strategy on enhancing productive thinking skills in general. This is because implementing the generative learning strategy helped improve students' ability to control their thinking processes, allowing them to view learning as an interconnected unit of concepts, rather than simply a collection of scattered information.

Self-questioning and generative learning strategies contribute to enhancing critical and creative thinking in students, helping them review workflows, evaluate achievements, and raise questions that lead to the generation of new ideas. These strategies have proven effective in developing prediction, imagination, and problem-solving skills, which enhance productive thinking. This result can be explained by the fact that the generative learning strategy requires students to ask themselves questions while processing academic information. These questions are divided into pre-lesson, intra-lesson, and post-lesson questions, which contributes to increasing students' awareness of their own thinking processes.

Furthermore, the generative learning strategy helped focus students' attention, increasing their ability to make new predictions and identify the most important information. This focus positively impacted their thinking skills, as students were encouraged to pause, reflect on important elements of the material they were learning, and connect them to previous experiences. This strategy also contributed to improved comprehension and engagement with the material, preventing students from feeling bored and promoting active engagement during the lesson. This made students more enthusiastic and capable of engaging in various activities.

When comparing these results with previous studies, we find that the current results are partially consistent with the results of some studies that addressed the impact of cognitive learning strategies on developing thinking skills, such as the study by Al-Jadaili (2019), which demonstrated the impact of the self-questioning strategy on developing critical thinking skills and analyzing literary texts among ninth-grade female students, and the study by Al-Qahtani and Al-Qaseem (2019), which demonstrated the effectiveness of the self-questioning strategy in developing reflective thinking skills, in addition to the study by Al-Alyan (2022), which demonstrated the impact of brain-based learning strategies on developing productive thinking.

5.1 Recommendations

In light of the findings, the following recommendations can be made:

1. Hold training courses for English language teachers to familiarize them with modern strategies for teaching this language, including the generative learning strategy.
2. Include lesson notes for teaching this language using the generative learning strategy in English language teacher manuals.
3. Conduct further studies on the impact of the generative learning strategy on improving other language skills, such as listening, reading, and writing, and on developing other types of thinking skills.

Funding: This research received no external funding.
Conflicts of Interest: The authors declare no conflict of interest.
Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers.

References

[1] Abdul Fattah, I. (2021). The effectiveness of combining the strategies of scientific stations and idea gardens in developing productive thinking and love of mathematics among middle school students. *Journal of Mathematics Education,* 24, 7.
[2] Abdul Rahim, M. (2020). Using generative learning to enhance mathematical knowledge depth and confidence in learning mathematics for middle school students. *Journal of Mathematics Education, 23*(3), 130-176.
[3] Abu Ayadah, H., & Odeibat, A. (2022). Creative and innovative thinking for entrepreneurship. Amman: Dar Al-Riyada for Publishing and Distribution.
[4] Abu Jahjouh, Y., & Harb, S. (2013). The effectiveness of horizontal and vertical designs for educational websites in acquiring FrontPage skills, self-learning, and visual thinking among teachers. *Journal of Al-Quds Open University for Educational and Psychological Research and Studies*, 1(1), 164-206.
[5] Afana, A., & Al-Jaish, Y. (2009). Teaching and learning with the brain's two hemispheres. Amman: Dar Al-Thaqafa for Publishing and Distribution.

[6] Akin, H., & Lynn, B. (2017). A study of the effects of thinking maps on the achievement of students in middle grades science. Theses and Dissertations, 255. VA: https://csupress.columbusstate.edu/theses_dissertations/255
[7] Al-Ajmi, L. (2003). The effectiveness of the constructivist and cognitive models in enhancing academic achievement, modifying alternative conceptions, developing basic science processes, and attitudes toward science for 2nd-grade middle school students. College of Education for Women, Riyadh, Saudi Arabia.
[8] Al-Haja, A. (2021). The effect of using the generative learning model in developing some reading skills in English for middle school students. *Manoufia University Journal, Faculty of Education, 36*(4), 113-142.
[9] Al-Jasmi, H. (2022). The impact of using the generative model on learning some basic skills and cognitive achievement in table tennis. *Journal of Sports Education Research*, 37(143), 61-68.
[10] Al-Omaria, S. (2015). Creative thinking. Amman: Dar Al-I'sar Scientific for Publishing and Distribution.
[11] Ashqar, S., & Al-Khatib, M. (2019). Developing a unit on chemical reactions based on the backward design model to enhance logical thinking and the retention of learning among 9th-grade students. *Educational Journal, Sohag University, 56*(1), 731-799.
[12] Fiorella, L., & Mayer, R. E. (2015). Learning as a generative activity: Eight learning strategies that promote understanding. New York: Cambridge University Press.
[13] Fiorella, L., & Mayer, R. E. (2015). Learning strategies that foster generative learning. Springer Science Business Media.
[14] Fiorella, L., Stull, A. T., Kuhlman, S., & Mayer, R. E. (2020). Fostering generative learning from video lessons: Benefits of instructor-generated drawings and learner-generated explanations. *Journal of Educational Psychology, 112*(5), 895-906.
[15] Hashisho, N. (2009). Exploring the reality of teaching English in public schools in Jordan's lower basic stage. The University of Jordan.
[16] Ibrahim, I., Senji, S., Ali, A., Abdel-Sadek, H., & Waheed, S. (2021). The use of the generative learning model to develop jurisprudential concepts in Islamic education for middle school students in Iraq. *Journal of the Faculty of Education, Benha University, 32*(125), 497-534.
[17] Jaber, S. (2019). The effect of the generative learning strategy on the achievement of Arabic grammar among 5th-grade literary students. *Journal of Educational and Psychological Sciences*, 140(1), 622-660.
[18] Jaber, W. (2002). Teaching the Arabic language: Theoretical concepts and practical applications. Amman: Dar Al-Fikr Publishers.
[19] Jenning, E., & Lubiniski, R. (1981). Strategies for improving productive thinking in the language-impaired adult. *Journal of Communication Disorders,* 14(4), 71-255.
[20] Khalaf Allah, S. (2002). The guide to teaching. Amman: Dar Jehina for Publishing and Distribution.
[21] Konar, N. (2011). Communication skills for professionals. Prentice Hall of India.
[22] Osman, H., & Al-Shahrani, S. (2022). The effectiveness of the generative model in learning synonyms and antonyms in English in Saudi Arabia. *Journal of the Faculty of Education, Wasit University,* 3(46), 464-445.
[23] Saada, J. (2015). Thinking and learning skills. Amman: Dar Al-Massira for Publishing and Distribution.
[24] Suleiman, T. (2021). The effectiveness of some strategies based on cognitive load theory in developing productive thinking and self-regulation skills in science for middle school students. *Educational Journal for Publishing and Distribution*, 81(1), 277-333.
[25] Zaytoun, H. (2009). Teaching strategies: A contemporary view of teaching and learning methods. Cairo: Ilm Al-Kutub for Publishing and Distribution.