



9E Learning And Teaching Model And Its Application In Higher Secondary Education School System

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Abstract: The purpose of this study was to implement the 9E Learning and Teaching Model (9E LTM). The impact of Critical Thinking Skills (CTS), analysis, and inference on students' statistics achievement observed through constructivist theory. A population of higher secondary school statistics students and 220 students sample was drawn, randomly. Two aggravation instruments were used: one for the 9E teaching and learning model, and the second was about learning statistics by analysing and inference CTS. The results showed a significant relationship between the CTS inference skill and the students' 9E learning and teaching model was 0.95. There was also a significant relationship between the inferences skill of CTS and 9E LTM in students. The results show that the 9E LTM is a more operative learning method to improve the analysis and inference of CTS. Consequently, it is acclaimed that statistics staff should adopt the 9E LTM for teaching, and better performance in analysing and inference CTS statistics.

Keywords: 9E Learning, Teaching Model, Analysis and Inference, Inferential Statistics, Critical Thinking Skills.

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1. Introduction

Critical thinking skills play a crucial role in student learning all around the world, to be considered challenging for the staff. Each time it has to do with teaching and learning, analysing and inference is complex for the student to understand the content with CTS. 9E learning and teaching model has elicited engage, explore, explain, elaborate, evaluate, extend, echo, and e-search. All these nine stages help the staff to improve student learning and CTS. Learning statistics also helps in emerging progression steps of analysing and inferences. Positive change toward learning in the subject content area helps in the process of learning and strongly influences CTS. The main issue is that students are not able to analyse and infer the subject of statistics through learning (Basri & Asari, 2019). In many circumstances, the lacks of student learning are of the 21st century is perceived in statistics content and in their learning methodology. Therefore, researchers Wahyuni, Sanjaya, Erman, and Jatmiko (2019) expressed that content learning concepts in the past about inference and analysis were not capable of better learning. Furthermore, there are few studies integrated with CTS on the learning model (Carkit, 2013; Gurbuz, 2012; Sahin, 2014; Yerdelen, 2013).

The critical thinking concepts of the 9E Learning and Teaching Model must be incorporated into the learning process. Learning with the CTS needs to be examined in relation to the analysis and inferences of interpretations established. This is often done using a testing instrument created to evaluate a student's learning according to the 9E LTM. The main objective of the study is to explore the analysing skill of CTS through the 9E LTM and also to examine the inference skill of CTS through 9E LTM in students to measure the 9E LTM effectiveness in teaching methodologies. The assessment tool was administered during the study. Analysis of the results of analysis and inference skills.

In outdated teaching lines of attachment to the students, the related results, for example, Students' learning objectives, learning strategies, and concept of learning in education and what instruction strategy should be used to learn about analysing and inference (Din, 2020). Therefore, the focus of the reorganisation of student learning in the field of statistics is to explore the 9E learning and teaching model on analysing and inferring critical thinking skills in statistics students in the higher secondary education school system in Pakistan. Students are further able to think CTS and imitate analysing and inferences. Most researchers find that the student only takes his own perception of learning with CTS when he adopts a new method of learning (Ayish & Deveci, 2019). The teaching and learning model observe the learning pattern of students learning, which is based on what they are able to learn naturally. Different learning models are presented by research scholars, which improved students' learning skills over a period from 3E, 4E, 5E, 7E, and the recent 9E presented by Kaur and Gakhar (2014).

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This study will assist students in using the 9E LTM to manage in modern workplaces. This study will inspire faculty to use 9ELM, mainly when teaching inferential statistics, to improve student learning. This study will open the door for school officials to adapt 9ELM in the teaching of inferential statistics. Instructors should be encouraged to use 9ELM to upgrade the teaching methodology and make it more trying to engage, participatory, and satisfying. Researchers might use this study as important related research to focus their attention on students in high school's ability to analyse data and inferences using the determined 9E LTM when teaching inferential statistics.

2. Literature Review

Statistics are now mandatory in the set of studies throughout all spending much time because it is recognised to be an integral component of overall education. Knowing about statistics is distinct from knowing about an empirical subject such as mathematics, economics, or psychology. The learners can be taught how to "*find knowledge new to them*" and how to convince them that what they have learned is factual, that is, under the direction of a teacher. Statistics is the study of problem-solving. Statistics issues are comparable to all other problems that individual student's approach. The aims or intentions of the learning process determine the teaching methodology. These priorities fall into three categories: Standards for knowledge and skills, comprehension, and real issue (Wei, Lin, Chen, & Chen, 2022).

In general, teachers want their students to learn statistics in a significant way, use it to deal with difficulties, and develop the various statistical abilities necessary to tackle the issues that they face in daily life. Modern education, but not education, is necessary to acquire these skills and ensure that they last a period. Some educational methods have been used in the literature on statistics education to teach and learn statistics. Although the 9Es teaching and learning paradigm is typically used to teach science because it is built on analysing and drawing inferences, some people have used it to teach statistics (Kramer, 2020).

The learning cycle was observed for 3E (Karplus & Their, 1967), 5E (Bybee, 1997), and 7E (Eisenkraft, 2003). Karplus & Their (1967) presented the "*5Es Learning Cycle*" later on, Roger Bybee (1997) modified it according to the Biomedical Sciences Syllabus Studies (BSCS) program, exploring new knowledge or learning more about what is basic requires the development of an understanding of both our prior knowledge. Later on, the 9E teaching and learning model (Kaur & Gakhar, 2014). As well as the first information acquired through fresh investigations through 9E LTM. In the literature, various iterations of the learning cycle can be observed.

Constructivism is a teaching approach that examines how students conceptualize learning. This approach ensures that each student enters the learning atmosphere with some past knowledge, and on the basis of this learning, they construct new learning. Based on Piaget's ideas of cognitive development and Vygotsky's cognitive development learning, the constructivist learning method developed by Bruner is central (Suhendi, 2018). The constructivist method of learning assists students in providing meaning to their learning in their thinking (Jarvis & Baloyi, 2020). Students who engage in learning through exploration develop their new knowledge by focusing on their circumstances (Zhong & Xia, 2020).

2.1 Critical Thinking Skills

Researchers describe critical thinking skills in a wide range of ways, depending on the context in which they were used. They all concur that Bloom has strong cognitive abilities. Critical analysis that is focused on choosing what and how one should believe or conduct is described as having critical thinking skills (Ardhian et al., 2020). Alsaleh (2020) stated that critical thinking skill is described as the application of cognitive techniques and approaches to improve the prospect of a desired outcome. An expert opinion provided by Facione (1990) illustrates the utilisation of all competencies. It has subcategories for self-regulation, inference, analysis, evaluation, interpretation, and analysis. As a result, the research will use discussion as a method to help students by developing CTS, especially in analysing and inference. The researcher only considers analysis and inference as critical thinking skills.

Different researchers emphasise the importance of helping statistics students at all educational levels enhance their critical thinking skills (Erdogan, 2019; Mahanal, Zubaidah, Sumiati, Sari, & Ismirawati, 2019). Mahanalat et al. (2019) clearly indicate how applying critical thinking skills to statistics could improve learning inference and analysis. Additionally, it is acknowledged that developing critical thinking skills to their full advantage is essential for the learning experience (Sokhanvar, Salehi, & Sokhanvar, 2021). Hand, Chen, and Suh (2021) pointed out that the evidence and research show the advantages of encouraging critical thinking skills in students at all educational levels when studying statistics. It is acknowledged that developing one's critical thinking skills are a crucial component of academic learning (Brookfield, 2022). This clearly states that learning should be focused on improving critical thinking skills. All individuals are aware of how critical thinking skills are important (Assi, Saad & Sankaran, 2022), and it has been proposed to use them in all subject areas (Paul & Elder, 2019).

2.2 E-Learning Model

The E instructional model is an idea that has the potential to analyse how knowledge develops during learning exercises (Eisenkraft, 2003). In addition, various models, like 3E, were Explore, Explain, and Elaborate; other

recommended approaches are 4E, Engage, Explore, Explain and Evaluate. (Çalık & Ayas, 2005; Çalık, Ayas & Coll, 2010). The 5 E instructional learning model was developed by Bayee (1997). Bayee (2015) presented instructional theories: a review that has the ability to teach methods efficiently. He evaporates the 5Es model into the five phases stated here, including engaging, Explaining, Elaborating, Exploring, and Evaluating.

The 5E approach to learning helps students with difficulties corresponding; it encourages the student to participate in learning activities and helps how they integrate new information with prior knowledge and changes how students feel about learning statistics. The 5E learning process can also help students evaluate their different perspectives rather than limiting learning to what is found in the book (Cheng, Yang, Chang & Kuo, 2015). However, prior to conceptual teaching and learning, assessing the pupils' other beliefs and previous knowledge is essential.

The 7E model is related to the research studies Eisenkraft (2003) extended on the BSCS 5E model; this is among the most popular and very well-teaching models applied today. Eisenkraft (2003) further stated seven prominent components, i.e., elicit, engage, explore, explain, elaborate, evaluate, and extend the model. Yerdelen (2013) approved his study with the purpose of investigating how the 7E learning model, whose different terms have been improved, affects the competence of high school students in the teaching and learning process.

2.3 9E Learning and Teaching Model

To carry out the process of teaching and learning effectively, the process should incorporate active participation by both the student and the teacher. To do this, Kaur and Gakhar (2014) suggest using the 9E learning and teaching model. The nine different Es that must collaborate in teaching and learning with more excellent proficiency make up the 9E teaching and learning process and are beneficial for analysing and competence to improve overall performance objectives. It considers the following:

- The knowledge and abilities provided to the students.
- When students are prepared to learn and achieve academic learning objectives and continually learn with a set of assignments, the subject matter is taught in the process.

2.3.1 Elicit

Acquiring the student's previous knowledge is essential, though. What prior knowledge do they have on the particular topic? It can all be conducted through discussion, short tests, and learning objectives. In addition, it is an excellent time to answer some questions and to determine the topics that interest students.

2.3.2 Engage

It comprises piquing learners' curiosity in thought or concept and informing them of what they already know, and making students aware of their own understanding of the concept. This phase serves as a form of introduction phase to get students excited about learning. Students are, therefore, not encouraged to provide the correct reasons.

2.3.3 Explore

In this phase, the students are particularly engaged. By careful observation, students put their knowledge to use and acquire knowledge of the ideas. Interacting with students, they try to investigate scientific information. At present, teachers encourage students to use videos, the Internet, computers, etc., to address these issues.

2.3.4 Explain

The teacher may be the most proactive in this phase. Students discuss with one another their personal experiences. It is encouraged for students to contrast their prior knowledge with the new information and clarify how the old and new ideas are related. Different teaching strategies, including simulations, analogies, conversations, and movies, may be useful to a teacher or learners.

2.3.5 Elaborate

Students are urged to incorporate and connect their new knowledge with their daily activities. To help students develop their critical thinking abilities, worksheets, sketching activities, and challenging situations might be used. To help students develop their critical thinking abilities, worksheets, sketching activities, and challenging situations might be used.

2.3.6 Evaluate

Students examine and make inferences about new knowledge of the concept(s) learned during the previous stages. Finally, teachers check the improvement of the students at this stage.

2.3.7 Extend

How can you convince learners to use or extend the knowledge in a different situation during this phase? Students draw connections within and outside the concept(s) or ideas being studied. They share the ability to interpret, integrate, and extend principles.

2.3.8 Echo

In this stage, which is known as the practice or repetition stage, the learners are strengthening the key learning objectives, and they have arisen across in the exploring and explaining stage. The teacher's job is to verify that the pupil has learned the concepts being taught and afterward give the essential recommendations or encouragement, as preferred. The information obtained even during the echo step is subsequently used further throughout the elaboration phase. Depending on the needs and interests, several levels of technology engagement may be used.

2.3.9 E-Search:

By embracing the use of technology in the process of delivering education, the "9th E" serves as the connecting element that unites those other "9 Es" in the model. Depending on the needs and interests, several levels of technology engagement may be used and the student's as well as the teacher's preferences.

We can comfortably assume that the 9E learning and teaching model represents one of constructivism's more well revisions in light of several research (Morris, 2019). Awidi, Paynter, and Vujosevic (2019) moreover intended to assess the depth to which the fundamental strategy is integrated into the learning regarding incorporating statistics to enhance learning based on the concepts of the students.

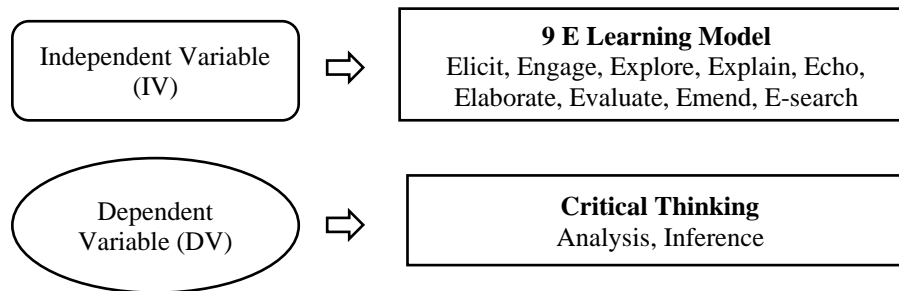


Figure 1: The variable of the study

2.4 Learning Analysing and Inference

The ability to think critically helps students improve their critical thinking skills. Analysis skills are crucial and significant for students' learning because it enhances their ability to express concepts (Dewi & Primayana, 2019). Students can compare, generalize, and assign key ideas by analysis. Additionally, students possess the ability to connect cause and consequence and draw conclusions (Malmia et al., 2019). It is widely acknowledged that students studying statistics can learn from the association between the 9E learning and teaching model and their ability to analyse and inference (Assi, Saad & Sankaran, 2022).

Identifying these relationships can be beneficial for both professionals and learners so that they can use the most effective methods of instruction based on the learners' knowledge to help students improve their ability to analyse and reach inferences. Putri and Maimunah (2020) stated that the development of critical thinking skills in students through learning analysis and inference is created. Some studies have revealed that learning, analysis, and inference skills are closely related (Holmes et al., 2021). Considering that the 9E learning and teaching model may be so crucial to developing critical thinking abilities and that higher secondary school students need to be able to analyze and make inferences, investigations of their relationships are essential. They lack the ability to analyse, conduct analyses and gain knowledge from challenging statistics topics. In light of this, the overall objective of the current research is to find the relationship between the 9E learning and teaching model on the analysis and inference of critical thinking skills in statistics students in the higher secondary education school system in Pakistan. The only element addressed in this research was the idea of inferential statistics through analysis and inferences.

3. Research Objectives

The main purpose of this study is to find students learning about analyse and inference of CTS with the following research objectives:

- i. To explore the analyzing skill of CTS through the 9E learning and teaching model in students.
- ii. Examine the inference ability of CTS through the 9E learning and teaching model in students.

3.1 Research Questions

The following are the research questions of this research study:

- i. What is the analyzing skill of CTS through the 9E learning and teaching model in students?
- ii. What is the inferences skill of CTS through the 9E learning and teaching model in students?

The research hypotheses are as follows.

- i. **Ho:** *There is no significant analysis skill of CTS through the 9E learning and teaching model in students.*
- ii. **Ho:** *There are no significant inferences of CTS skills through the 9E learning and teaching model in students.*

3.2 Methodologies

The populations of this research include all the statistics students of higher secondary school in the Multan district of Punjab Province. All second-year students of the Multan District Public High Schools in Pakistan's Punjab Province were represented as the target population of the research study. However, dealing with the target population involves too much time and effort. The population restrictions of the research study only included the students who could be reached. In the Multan district, 750 second-year students were included in the chosen population for the academic year 2021–2022. Four Higher Secondary Schools (two boys and two girls) were selected as the study sample. A total of 220 students were included in the study sample, and 55 students were selected systematically from each GHSS. The 33% of the students in the sample had less than 50% results, 33% had less than 70%, and 34% had less than 90% were selected from each school. A detail of the sample is given in Table 3.1.

Table 1: Sample of the study in terms of the school

Results	Percentage of Selected Students	No. of students Selected School No.1	No. of students Selected School No.2	No. of students Selected School No.3	No. of students Selected School No.4
Below 50%	33%	18	18	18	18
Below 70%,	33%	18	18	18	18
Below 90%	34%	19	19	19	19
Total	100%	55	55	55	55

Source: Generated by the current study

3.3 Data Analysis

Table 2: Regression test for the relationship between the learning model and critical thinking skills

Variables	R	R Squared	Adjusted R Squared
9 E Learning Model and Critical Thinking Skills	0.48	0.225	0.214

Source: Generated by the current study

Table 3.2 shows that the correlation value of the 9E learning and teaching model with critical thinking skills is .48 and R² is 0.225, and adjusted R² is 0.214, which means that 0.214 of changes in CTS are determined by these variables.

Table 3: Variance analysis test for regression

Source	df	Sum of Squares	Mean Square	f	Sig.
regression	9	3537.514	1241.5	17.45	0.0001
residual	211	13355.16	64.231		0.0001
total	220	16803.126			

Source: Generated by the current study

The findings of the variance analysis are discussed in relation to the significance of the regression model, which indicates the importance of the model $F(9,211) = 17.45$, $P < 0.0001$.

Table 4: Regression coefficients for 9E learning and teaching Model and Analysis, Inferences (CTS)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	5.401	3.67			
analysis	0.382	0.080	0.453	5.254	0.001
inferences	0.28	0.068	0.256	-0.04	0.52

Source: Generated by the current study

The regression coefficient is examined in Table 3. The findings indicate that the 9E learning and teaching model variable can predict analysis and inferences (CTS).

Table 5: Person correlation coefficient for 9 E learning and analysis, inferences

Variable	N	Pearson value	sig
9 E learning Model	220	0.14	0.014
9 E learning Model - analysis	220	0.12	0.128

9 E learning Model - inference	220	0.16	0.025
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Source: Generated by the current study

Table 3.5 shows the relationship between the 9E learning and teaching model and analysis, inferences (CTS), and its components. Results indicate a significant connection between 9E learning, teaching model, and analysis, and inferences (CTS). Pearson's value is 0.14, which is positive and significant at levels of 0.05. Consequently, argues that if one improves, the other will increase. The results also indicate that there is a significant relationship between the 9E learning and teaching model and the analysis, inferences (CTS) in which Pearson's value is 0.15 and has a significant level of 0.025. However, there is no significant relationship between the 9E learning and teaching model and CTS's analysis and inferences components. Pearson's values are 0.016 and 0.12, respectively.

3.4 Correlation Analysis

Determine the two-dimensional analysis and inference were associated with EC, EG, EP, EL EP EV, and EM approaches of the 9E learning and teaching model. Thus, with the use of 9 E learning, teachers construct and enhance CTS by adopting constructivist theory, i.e., Elicit (EC), Engage (EG), Explore (EP), Explain (EL), Echo (EO), Elaborate (EB), Evaluate (EV), Emend (EM) and E-Search (ES) in subject statistics. Table 5 below contains the analysis findings.

Table 6: Correlation analysis

Variables	1	2	3	4	5	6	7	8	9	10	11
Analysis	1										
Inferences	.52**										
CTS	.48**	.62**									
Elicit (EC)	.41**	.35**	.49**								
Engage (EG)	.31**	.36**	.34**	.61**							
Explore (EP)	.38**	.41**	.43**	.33**	.45**						
Explain (EL)	.27**	.30**	.38**	.21**	.31**	.39*					
Elaborate (EB)	.36**	.39**	.45**	.44**	.43**	.38**	.46**				
Echo (EO)	.36**	.33**	.38**	.39**	.37**	.33*	.29**	.55**			
Evaluate (EV)	.30**	.38**	.36**	.27**	.30**	.36**	.38**	.31**	.39**		
Emend (EM)	.39**	.41**	.40**	.36**	.39**	.35**	.34**	.41**	.35**	.53**	
E-Search (ES)	.38**	.36**	.27**	.32**	.38**	.36**	.38**	.30**	.34**	.38**	.41**

*Correlation is significant at the 0.05 level (2-tailed), **Correlation is significant at the 0.01 level (2-tailed)

Source: Generated by the current study

- i. The 9E learning and teaching model includes elicitation, engagement, exploration, explanation, echo, elaboration, evaluation, emendation, and search by electronic means. With 36 items that measured 9 phases of learning, Cornbach's alpha coefficients were .71(elicitation), .80 (engagement), .75 (exploration), .82 (explanation), .79 (echo), .83 (elaboration), .81 (evaluation), .71(emendation), .77(e-search) and for the 9E learning and teaching model, the questionnaire was 77.
- ii. The critical thinking skills test was developed as a benchmarking tool for the skill evaluation of higher secondary school students. There are 60 multiple-choice questions in this test, and they evaluate two levels: the ability to address the questions through analysis and inference is limited. The Cronbach's alpha coefficients in this research were .72 for analysis, .70 for inference, and .81 for the entire test. Data were analysed using SPSS 23.0 statistical analysis program. Regression analysis and correlation were used to determine the relationship between independent and dependent variables.

The findings revealed a positive correlation between the CTS 9E learning, teaching, analysis, and inference components. The lowest correlation was observed between the analysis component and the explanation (EL) 9E learning and teaching model ($r=.21$, $p<.01$). In the inference component, the highest correlation was observed between the dimension of the inferences and the elaborate 9E learning and teaching model ($r=.45$, $p<.01$).

A strong relation and a significant, meaningful difference were observed between both independent variables ($p < .01$). There was a medium-level correlation between two dependent variables of CTS ($r=.62$, $p<.05$) and EO ($r=.55$, $p<.05$), EM ($r=.53$, $p<.05$), EG ($r=.61$, $p<.05$). Significant correlations occurred between the CTS analysis and inferences components and 9E learning and teaching model.

3.5 Analysis Of Variance CTS By 9 E And Teaching Model

The relationship between both the CTS two-dimensional analysis and inferences and the 9 E learning and teaching model was revealed by Analysis of Variance (ANOVA). The results are given below in Table 4.

Table 7: Analysis of Variance Results for 9E LTM of Analysis and Inferences (CTS)

CTS	9 E Learning & Teaching	N	M	SD	Mean Square	F _(3, 221)	P
Analysis	Elicit	220	8.03	1.68	4.532	3.631	.149
	Engage	220	6.68	1.13			
	Explore	220	7.64	1.68			
	Explain	220	8.20	1.60			
	Elaborate	220	7.19	1.41			
	Echo	220	7.83	1.52			
	Evaluation	220	7.22	1.39			
	Emend	220	6.55	1.28			
	E-search	220	6.27	1.10			
	Inferences	Elicit	220	8.05	1.14		
Engage		220	7.18	1.11			
Explore		220	7.63	0.83			
Explain		220	7.11	1.39			
Elaborate		220	8.18	1.30			
Echo		220	7.83	1.46			
Evaluation		220	8.15	1.29			
Emend		220	7.55	1.61			
E-search		220	6.14	0.66			
*p<.01							

Source: Generated by the current study

The results showed that there were no significant differences in the dimension of the analysis dimension ($f=3.631$, $p<.01$) in terms of learning and teaching of 9 E. In the analysis dimension, E-search had lower scores ($M= 6.27$, $SD= 1.10$) than emend ($M= 6.55$, $SD= 1.28$) and engage ($M= 6.68$, $SD= 1.13$) ($F = 3.631$, $p<.01$). On the dimension of inferences, E-search ($M = 6.14$, $SD=0.66$) had lower scores than explain ($M = 7.11$, $SD =1.39$) and engaged ($M =7.18$, $SD=1.11$) ($F = 3.543$, $p<.01$).

The analysis of the score on the CTS dimensions scale, explanation ($M = 8.20$, $SD =1.60$), and elicitation ($M =8.03$, $SD =1.68$) had higher scores than echo ($M=7.83$, $SD=1.52$) and elaborate ($M = 8.18$, $SD = 1.30$). Analysis of the inferences dimension and analysis scores of the CTS scale revealed a large effect size. The size of the other dimension's influence was determined to be moderate (Assi, Saad, & Sankaran, 2022). On the analysis and inferences aspects, teaching with 9E LTM had a significant influence.

4. Conclusion And Discussion

In this study, the influence of the 9E teaching and learning model (9E TLM) on students studying statistics in Pakistan's higher secondary education system's ability to analyze and make inferences was investigated. The findings of the regression and correlation analysis revealed that a unique 9E teaching and learning model had a substantial impact on CTS. We discuss the significant connections between the 9E TLM and analysis, and moreover, with inferences. Students who follow the 9E TLM frequently allow students to explore analysing and inferences. The findings of this research are similar to previous research, and research has shown important connections between 9E TLM and CTS (Assi, Saad & Sankaran, 2022; Ching & Chaun, 2004).

At the outset, the 9Es learning model is being used to construct inferences and analysis that teachers help to gain in a thoughtful way, one that will improve the CTS learning of the learners. Learners can learn with the 9E TLM. To ensure that teachers will continue to educate using 9E TLM while demonstrating their deepest gratitude and in their content learning, students will adopt ensuring adherence to learning of analysis and inferences. This article provides recommendations for the analysis and inference abilities that students might improve learning and how to integrate students' learning of these skills with their 9E TLM. Students in higher secondary schools would learn the skills according to the studies, and they were capable of assessing, and recognising arguments through analysis, questioning evidence, making coincidence judgments, and drawing other conclusions through inferences.

The significance of the research on the connections between the 9E learning and teaching model and learning by way of analysis and inferences (CTS) goes further than just adding to the existing literature but also in regard to its significant effects on students' learning education and development of academic progressions in analysing an argument, identifying argument, and examining ideas. 9E learning and teaching model contributes to learning through inferences (CTS); the development of analysing and inferring skills might result from education that fully considers the learning model improving skills of querying evidence, conjecturing alternatives, and drawing the conclusion.

According to this study, 9E LTM can strengthen educational impacts. The disparity between the students' learning phases includes suggestions for more intricate 9E LTM include in order to effectively maximise the

educational benefits. Teachers should be encouraged to use the 9E LTM approach because it has such a high impact on learning and eventually incorporate it into their own more effective teaching strategy. Furthermore, the government of Pakistan made a wise choice when it opted to implement a constructivist approach to teaching at all levels and subjects in K–12 schools there. This is evidenced by the high effect of 9E LTM that 5 primary studies suggested. Additionally, to make it easier for higher secondary school teachers to adopt the researchers' findings regarding the usefulness of the 9E LTM, it will be helpful for university-level researchers serving as counsellors during a course. The fact that the students engaged in the assignment more promptly. The fact that short-term implementations of 9E LTM have been more successful when they are unexpected may be the reason for this. Regarding participation in short-term or long-term research investigations, researchers could use 9E LTM to compile all of their knowledge. As a result, the CTS in the 9E LTM can be used to assess learning and examine analyses and inferences of student learning.

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