



## An Analysis of Chemical Engineering Students' Needs on Instructional Reading Strategies

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### Abstract

Reading is an important macro skill besides speaking, writing and listening. Reading is a receptive skill, yet it is still essential for success in both academic and in everyday life. Therefore, the study aims at analyzing chemical engineering students' needs for instructional reading strategies to help them comprehend the text. A qualitative research design was used for this study with quantitative data collection. Data were collected through questionnaires from 60 chemical engineering students and analyzed using descriptive statistics (the interpretations of percentages). The questionnaires consisted of one section, which had ten different kinds of instructional reading strategies. Students were asked to select from the most important reading strategies to the least important instructional strategies for them. The results show that there are seven important reading instructions selected by chemical engineering students (above 90%) that is drawing conclusion, making prediction, identifying cause and effect, distinguishing between facts and opinions, comparing and contrast, identifying the main ideas and identifying supporting details. Chemical engineering students also had favorable attitudes on three other instructional reading strategies that were considered important with the percentage of below 89 percent they are recognizing and interpreting writer's view, summarizing and drawing conclusions. Based on the analysis of students' needs, majority of chemical engineering students believe the seven most important instructional reading strategies should be incorporated into the reading materials as reading comprehension activities.

**Keywords:** need analysis, reading strategy, reading instruction, engineering students

### Introduction

Both general English and English for Specific Purposes are taught in English in Indonesia. General English is primarily taught at the secondary school level in Indonesian curricula. General English and English for Specific Purposes are meant for higher education levels, respectively. The goal of English language instruction in higher education is to provide students with the knowledge and abilities necessary for oral and written communication, or at the very least, to enable them to comprehend concepts that are connected or unrelated to their course of study.

Reading ability is one of four crucial English competencies. Even though reading is one of the receptive skills, it is nevertheless crucial for success in both academic and everyday situations. People are said to be able to increase their knowledge and access global information through reading. Reading involves reading written texts unless one has the ability to communicate with individuals anywhere in the world through spoken language. However, a lot of publications and educational resources are not created and produced with students' needs in mind. Students' English skills do not, as a result, encompass what they require for their English learning or how they desire their English class to be conducted.

Therefore, need analysis has been a primary step in the design and development of any educational program. The term of need analysis refers to a way of collecting and assessing information for a course design (Hyland, 2006). In other words, it is a technique of establishing how and what a course should be like. According to Brown (1995) that need analysis provides important information can be used for curriculum development. He further clarifies that the information can be provided by the target group such as students, teachers, and administrators; the audience, namely teachers, teacher aids, administrators, and supervisors; the need analysts, for example consultant, faculty member, and the resource group, namely parents, financial sponsor. There have been many studies conducted on need analysis for designing and evaluating English teaching and learning programs (Gul & Mede, 2015). While some others have focused on identifying students' needs to design and develop teaching and learning materials. Need analysis is also

conducted to find out what students' wants and deficiency for the course. So that, the confirmed program will be followed and the problem during the course can be solved. In other words, good teaching resources are those that can be put to use and aid students in their learning. To that purpose, it is important to design reading materials that take into account both students' and lecturers' demands. The setting in which education is provided, the advancement of information technology, and the local culture all influence the demand for instructional materials. This implies that different analysis outcomes for the same subject at other universities are possible.

Furthermore, when developing English reading materials for students, teachers need to employ some reading strategies to help students comprehend the text better and to be critical reader. Why teachers need teaching strategies when they teach reading comprehension. According to Hudson (2007) that a reading strategy is an interactive process that aims to obtain meaning from related text. To get a good reading comprehension, readers need more than just mastery of terminology, background information, and motivation. The use of reading strategies by language learners will aid them in overcoming communication hurdles, increasing their awareness of the language's comprehension and learning techniques, and building their confidence in studying reading, which receives little exposure to English outside of the classroom. This may be accomplished via reading methods, and instruction on reading strategies has to be part of the curriculum (Raqqad et al., 2019). According to research by Banditvilai (2020), reading strategies help students' reading comprehension. The strategies—skimming, scanning, generating predictions, and questioning—helped students better understand the text and they did so with positive attitudes. Similar research was done by Khoshsima (2014) to determine how summarizing research affected Iranian intermediate EFL learners' reading comprehension. The results showed that summarizing strategies have a big impact on how well readers can understand what they are reading. Another study by Barrot (2016) investigated the use of reading strategies by L2 readers aged 16–17 years from a private university in the Philippines according to different text types. The findings revealed that

students used a variety of reading strategies but that the text type had no significant influence on which types were chosen. Barrot asserts that teachers can support particular reading strategies that are advantageous to students by using this knowledge. Additionally, the results make clear for learners the connections between awareness of reading strategies and different kinds of text. The author contends that employing many strategies simultaneously increases readers' adaptability; as a result, he supports teaching students to utilize multiple strategies at once.

There have also been some studies conducted in the Indonesian context about the importance of reading strategies for students reading performance. For example, a study by Pammu et al., (2014) investigated the metacognitive reading strategies among less proficient students for EFL learners at Hasanuddin University, majoring in the English Department. The results showed a high level of metacognitive awareness of problem-solving strategies and a medium to low level of awareness of global and support strategies. Likewise, Marzuki et al., (2018) conducted an action research study of how the implementation of cognitive reading strategies can improve the reading comprehension ability of students of the Islamic Education Department Faculty of Tarbiyah and Teacher Science at Palu State Institute for Islamic Studies in Indonesia. The findings showed that students' reading comprehension had improved, as evidenced by their ability to correctly respond to questions based on the text, to predict the text's content from its title, to infer a word's meaning from its context, and to consider the meaning of other sentences in a paragraph.

These studies have emphasized the significance of reading methods for college students in numerous academic fields and nations. However, there has not been any specific study conducted to identify chemical engineering students' needs on instructional reading strategies for their reading comprehension performance. Therefore, the current study aims to fill this gap by finding out the requirements and preferences of chemical engineering students in terms of instructional reading strategies for their reading performance. The novelty of this study resides in its emphasis on the particular

instructional reading strategies that chemical engineering students need in the classroom. By concentrating on the hitherto understudied demands of chemical engineering students, this research can generate innovation. Overall, In order to enhance educational quality and guarantee that students receive the best learning opportunities, it is essential to analyze the instructional reading strategy demands of students. This research will respond to the following research question in order to accomplish these objectives: What instructional reading strategies are the most and least important for chemical engineering students to enhance reading comprehension?

### **Research Methodology**

Selecting the appropriate methodologies, whether for quantitative or qualitative research, is one of the most important phases of a research project. The finest study results may come from combining both types of research. In other words, there are benefits to both. The benefit of a quantitative method, according to Patton (2002) is the ability to assess a large number of respondents' responses with a small number of questions, allowing judgment and statistical data gathering. But the qualitative approach typically yields a wealth of specific information about a relatively small number of groups and cases. Furthermore, according to Denzin & Lincoln (2018) both qualitative and quantitative research can be used as instruments to share thoughts and conclusions with others by utilizing a range of formats, media, and communication methods. The researcher chose to use a survey questionnaire as the sole testing tool in this investigation. In other words, the researcher's decision to use a quantitative approach as her research design was influenced by the size of her sample. All of the research participants involved in the study were 60 chemical engineering students at Polytechnic ATI of Makassar. They were taken through simple random sampling.

Only surveys were used to acquire the data. Three components made up the questionnaires. The surveys had 10 instructional reading strategies, and students selected the strategies based on what they believed should be included in their reading comprehension activities and effective to enhance their reading

performance. The collected data were analyzed descriptively by calculating the respondents' responses in terms of percentage. Descriptive analysis serves as a flexible source of product information in business, government, and research contexts because it makes it possible to acquire objective, thorough, and instructive sensory data (Kemp et al., 2018).

## Findings and Discussion

### Findings

An analysis of chemical engineering students' needs was obtained by filling out a questionnaire that was sent online via Google Forms. The questionnaire consisted of 10 reading strategy instructions which filled out by sixty (60) students majoring in chemical engineering at Polytechnic ATI of Makassar. Students were asked to choose from the most important to the least important reading strategies that will be used as reading instructions for their reading comprehension activities.

**Table 1.** The percentage of chemical engineering students' preferences on instructional Reading strategies (90-100%)

No.	Instructional Reading Strategies	Percentage (%)	
		Important	Not important
1.	Drawing a Conclusion	100,0%	0%
2.	Making prediction	98,3%	1,70%
3.	Identifying cause and effect	98,3%	1,70%
4.	Distinguishing between Facts and Opinions	98,3%	1,70%
5.	Comparing and contrast	96,7%	6,70%
6.	Identifying the main ideas	93,3%	3,30%
7.	Identifying supporting details	90,0%	10%

Table 1 shows the most significant instructional reading strategies selected by chemical engineering students as reading comprehension instructions. The instructions will be integrated into students' reading materials as part of their reading comprehension processes.

Drawing a conclusion is the highest percentage of students responses' on how important the strategy instruction is for their reading materials. 100 percent of chemical engineering students chose drawing a conclusion as the most important instructional reading strategy among other strategies, and none of them thought the strategy was unimportant.

Furthermore, Table 1 also presents how many Chemical Engineering students select "making predictions" as one of their critical thinking instructional strategies. 98.3 percent of students believe that "making predictions" is a significant critical thinking instructional strategy for reading. Making predictions is a less significant teaching method for reading comprehension skills, according to one student (1.7%). In line with the strategy of identifying cause and effect, table 1 shows how chemical engineering students felt about using cause and effect analysis as a reading-related critical thinking skill. "Identifying cause and effect" is regarded by the majority of students (98.3%) as being crucial to be included into the reading materials. However, one student (1.7%) believes it to be less important. Similarly, 98.3% of chemical engineering students also believe the "distinguishing facts and opinions" instructional strategy is important for their reading materials. Only one pupil believes it to be the least significant (1.7%).

Next, the percentage of chemical engineering students who believe that "comparison and contrast" is a crucial instructional strategy is shown in Table 1 above. From the table, it is clear that 96.7% of chemical engineering students believe this instructional strategy to be important, whereas 3.3% of students believe it to be less important.

Table 1 also clearly displays the number of Chemical Engineering students' responses to identifying the main idea as an important instructional strategy for reading. As can be seen, 93.3 percent of students reflect that identifying the main idea activity is an essential reading strategy for them, while 6.7 percent of students believe that this activity is not very important.

The data in Table 1 also represents the percentage of chemical engineering students who agreed with the statement that reading

comprehension depends on the ability to detect supporting details as an important reading strategy. 90% of students concur that locating supporting information is a crucial instructional reading strategy. However, 10% of students say that they find "identifying supporting details" to be less crucial.

**Table 2.** The percentage of chemical engineering students' preferences on instructional Reading strategies (75-89%)

No.	Instructional Reading Strategies	Percentage (%)	
		Important	Not important
1.	Recognizing and interpreting writer's view	86,7%	13,30%
2.	Summarizing	85,0%	15%
3.	Drawing conclusions	85,0%	15%

The data in Table 2 presents the percentage of instructional reading strategies selected by chemical engineering students, which ranged from 75% to 89% based on the level of importance of the instructional strategies for their reading material development.

The first instructional reading strategy is recognizing and interpreting the writer's view. Table 2 shows that chemical engineering students agree that it's vital to recognize and interpret a writer's point of view as an instructional strategy that promotes critical thinking. 52 out of 60 students (86.7%) believe that understanding and analyzing a writer's point of view is a crucial instructional method. But 13.3% of students believe that recognizing and interpreting a writer's view is unimportant.

Additionally, the students also believe that the instructional strategies of "summarizing" and "drawing or illustrating" are also important for their reading material development. 51 out of 60 students (85%) believe those strategies are essential for their reading materials. Even though there are still 8 out of 60 students who assume that the strategies are not important.

## Discussion

The findings show that all chemical engineering students believe that, among other instructional reading strategies, drawing conclusions is the most crucial one for ensuring that students comprehend the reading comprehension material and develop their critical thinking abilities at the same time. In other words, the activity that the students choose to incorporate in their reading materials is drawing a conclusion. The benefits of learning activities that encourage students to conduct independent study have been extensively discussed by researchers. For instance, Rutherford & Smith (1988) stress that the



purpose of the classroom and the teaching materials is to assist the student in effectively utilizing the resources in order to promote self-discovery.

Furthermore, drawing a conclusion is a cognitive process in which students must be able to separate concepts or materials into their component elements in order to comprehend the organizational structure and discern between facts and conclusions. According to Bloom (1956) the improvement of intellectual abilities and skills, as well as the recall or recognition of knowledge, are under the cognitive domain.

Based on the research findings, making predictions, identifying cause and effect, and distinguishing between facts and opinions are the next crucial instructional strategies that chemical engineering students choose. The majority of students do, in fact, believe that these three reading instruction styles may satisfy their demands for reading comprehension activities. According to Berwick (1989), "need" is "the gap between what is and what should be" (p. 65). What "is" means could be similar to the current situation of the learner's knowledge and skills, and "what should be" might be interpreted as the target situation's requirements.

One common teaching method is to have students make predictions before giving them the right response. It takes numerous shapes. Language instructors may ask their pupils to guess what will happen next in a text, for instance (Brod, 2021). Likewise, Paul et al., (1990) also included making prediction (strategy-32: making plausible inferences, predictions, or interpretations) as one of their 35 critical thinking instructional strategies. Prediction before reading can "...activate prior knowledge, set a purpose for reading, and engage the reader from the outset," according to Pesa & Somers (2007, p. 31). They go on to say that making predictions can assist students in keeping track of their comprehension and ongoing interest.

Furthermore, Students must draw logical connections from the events in order to comprehend that every action has some sort of reaction or result when it comes to understanding cause and effect in reading. When analyzing a reading selection's cause and effect, students must utilize critical thinking (McCarson, 2021). Syamsir et al., (2021) states that an explanation of cause and effect tries to explain either the origin of an action or its results. This theory makes it simple for pupils to comprehend many aspects of the text and provides the reader with some stimulus for their brain to try to find cause and effect in the text. Similarly, one of the most important critical reading strategies is the ability to distinguish between facts and opinions. We read books, journals, newspapers, and magazines that mix facts with the author's viewpoint. Facts are things that have actually occurred, are true, and exist. However, beliefs about events, the truth of things, and existence are regarded as opinions. Facts relate to what we already know, but opinions discuss what we believe.

The next research findings revealed that comparing and contrasting is one of the most important critical thinking instructional reading strategies. Talebi & Marzban (2015) employ the eight steps of Sousa's (2004) significant reading strategies. These steps include previewing, contextualizing, questioning, reflecting, outlining and summarizing, evaluating an argument, and comparing and contrasting some relevant texts. Comparing and contrasting texts is a key strategy for helping students understand how the texts differ and how they are similar as well as to improve reading comprehension. Moreover, Paul et al., (1990) claim that noting significant similarities and differences is a crucial cognitive technique that enhances the internal learning process. Students who can effectively grasp internal processes will be self-taught. They will be able to fix the issue and effectively communicate their thoughts.

Equally important, identifying main ideas and supporting details are also two critical reading strategies that are considered important by students majoring in chemical engineering as activities in understanding a text. Students who are familiar with the structural elements of a narrative, for instance, may find it easier to concentrate on the text's more crucial information, such as the identity of the main character and the details of the plot. As students gain an understanding of the genre of the texts, they learn to look for and recognize this information as well as to use their structural knowledge to understand what the text is discussing. As a result, knowing how the text is organized enables pupils to predict, infer, identify main ideas, and draw conclusions while reading. When students are aware of how authors structure their texts, they can more readily identify the key concepts (Rosdiana, 2015). A study conducted by Boudah (2014) revealed that students with and without impairments who struggle with reading comprehension linked to grasping inferential main ideas may perform better when using the Main Idea Strategy. Students have the potential to become better readers when this method is applied consistently.

Furthermore, the strategy of identifying supporting details is as important as identifying the main ideas instructional strategy. According to Dole & Taggart (2010) supporting details is the details that clarify, support, and provide evidence for the author's position; it could include facts, figures, anecdotes, statistics, or professional opinion. Identifying the main idea first, and then seek for the information the author uses to explain it in more depth to identify the supporting details. The supporting details may appear in more than one paragraph if the main idea spans more than one.

The results of this research also showed that three instructional reading strategies were considered important by less than 90 percent of chemical engineering students. One of the strategies is recognizing and interpreting the writer's views. Because reading is a complex process, different people define the term "reading" in different ways. According to Day et al., (1998), one means of communication between the writer and reader is through reading. Reading is the process by which a reader comprehends the written message and relates

it to his prior knowledge. In other words, decoding, interpreting, and understanding written content are all steps in the process of reading.

A number of chemical engineering students also choose summarizing as their preferred instructional reading method for their reading materials, according to the results, in addition to understanding and comprehending the writer's viewpoints. Summarizing Text, according to Harvey & Goudvis (2000) is a process in which readers sort through the data in a text to extract and paraphrase the key concepts. It requires the reader to prioritize the information, summarize it, and then express it in their own words. Research conducted by Stevens et al., (2019) found that the main idea and summarizing instructions may enhance struggling readers' major identification and reading comprehension. Similarly, in a study on the effects of summarizing strategy on students' reading comprehension, Febriani et al., (2019) discovered that students who were taught using summarizing approach had greater reading comprehension of descriptive texts. So, it can be concluded that summarizing instructional reading strategy significantly improved pupils' reading comprehension.

The last instructional reading strategy regarded important by chemical engineering students is drawing conclusions. A conclusion is a judgment made after giving the information you read careful thought, according to Elder (2004). Usually, a decision is reached when all relevant data have been taken into account. In reality, the conclusion frequently expresses the paragraph's major point or perhaps the overarching theme of the section as a whole. This study supports the findings of other studies (Dolba et al., 2022), demonstrating the importance of teaching students how to look for evidence to support a certain conclusion by locating pertinent information in the text. The greatest instructive reading approach out of the ones previously described has thus been picked by chemical engineering students.

## **CONCLUSION**

Based on the research findings and discussions, it can be concluded that the majority of chemical engineering students value instructional reading strategies, which can add color and variety to activities for English reading comprehension in the department of chemical engineering at Polytechnic ATI of Makassar. Because students in higher education also require effective and efficient reading instruction in order to comprehend English text, it is also thought that the results of an analysis of chemical engineering students' needs for reading strategies will be advantageous for students' reading comprehension skills. More importantly, teachers are also responsible for teaching their students how reading instruction can assist them in reading comprehension. However, this study only offered a few instructional reading strategies, so there are limited choices in selecting reading instructions. In addition, the number of respondents, who were only 60 students, could not represent the choices of other students. Also, the findings may only be relevant

to reading materials for chemical engineering students at Polytechnic ATI of Makassar, as all of the participants in this study are from Polytechnic ATI of Makassar. Overall, it is expected that the findings of this study will be useful to educators in developing reading materials for students to enhance their reading comprehension of English-language texts.

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