

## Impact of SQ4R on reading comprehension of university students in an English for specific purposes (ESP) course

Wachiraya Bangkhadara<sup>1</sup>, Jeffrey Dawala Wilang<sup>2</sup>,  
Nillawan Newprasit<sup>3</sup>

Suranaree University of Technology, THAILAND<sup>1,2,3</sup>

<sup>1</sup>Email: [wachiraya.b@sut.ac.th](mailto:wachiraya.b@sut.ac.th)

<sup>2</sup>Email: [wilang@sut.ac.th](mailto:wilang@sut.ac.th)

<sup>3</sup>Email: [nillawan@sut.ac.th](mailto:nillawan@sut.ac.th)

**Abstract** - This study aimed to achieve three objectives: to identify the active reading strategies employed by undergraduate students in an English for Specific Purposes (ESP) course, to evaluate the effectiveness of the SQ4R model in enhancing students' reading comprehension, and to know their insights about the model. Descriptive analysis of survey data revealed significant positive changes in study strategies following the SQ4R intervention. Students demonstrated notable improvement in organizing material using flow charts, indicating enhanced capability in managing complex information. Similarly, highlighting techniques became more strategic, focusing on critical information. The organization of annotations into various formats also improved, pointing to more advanced note-taking and data processing skills. Additionally, the creation of practice tests increased, signifying greater engagement in active recall and testing. These findings underscore a significant shift toward more effective and engaged learning strategies among students. T-test results revealed a significant improvement in pre-test and post-test scores, confirming the effectiveness of the SQ4R model. Students' positive feedback further supports the utility of this model in enhancing active reading practices. The implications of this study suggest that the SQ4R model can be an effective tool in improving reading comprehension and engagement in ESP courses, with potential applications in other educational contexts as well.

**Keywords:** Active reading; SQ4R method; reading comprehension; university students

## 1. Introduction

University students in Thailand, like their peers elsewhere, face several challenges in reading comprehension, particularly in English for Academic Purposes (EAP) and English for Specific Purposes (ESP) courses. One significant challenge is limited vocabulary, which hampers understanding complex academic texts (Laufer & Ravenhorst-Kalovski, 2010). This is compounded by a general lack of exposure to English outside the classroom, which inhibits the natural acquisition of language skills (Renandya & Jacobs, 2002). Additionally, Thai students often need help with the cultural contexts of texts originating from Western countries, leading to difficulties in interpreting authors' intentions and nuances (Koda, 2005). Similarly, students globally need help with effective reading strategies, leading to superficial reading without deep comprehension (Grabe, 2009). The shift towards digital learning environments has also introduced distractions that can detract from focused reading as students navigate between different digital platforms and sources of information (Baron, 2017). Addressing these challenges requires targeted interventions that enhance vocabulary acquisition, contextual understanding, and strategic reading skills, along with adaptations in digital learning methodologies to foster deeper engagement with texts.

Improving English language proficiency is pivotal for academic success and professional advancement, especially in contexts where English serves as the medium of instruction or as a global lingua franca. Students' ability to effectively comprehend and engage with academic texts in English for Specific Purposes (ESP) courses is often hindered by inadequate language skills, which can have long-term implications on their career prospects and academic achievements (Alptekin, 2002). Despite these skills' critical role, many students need help with the complex vocabulary and specific jargon that ESP courses demand (Dudley-Evans & St John, 1998). This struggle is compounded by reading in a second language, which requires linguistic knowledge and a firm grasp of contextual and cultural nuances that influence text interpretation (Grabe, 2009). Effective reading strategies and continuous language support are essential to address these challenges. Strategies like active reading, contextual vocabulary acquisition, and structured comprehension exercises have significantly enhanced students' language proficiency and ability to handle ESP courses' demands (Mikulecky, 1990).

The objectives of this study were threefold: (1) to identify the active reading strategies employed by undergraduate students in an ESP course, (2) to evaluate the effectiveness of the SQ4R model in enhancing students' reading comprehension, and (3) to know their insights about the model.

Active learning has been crucial for raising students' engagement and comprehension at all educational levels over the past few decades (Rahman et al., 2022). It involves students actively developing comprehension of facts, ideas, and abilities by completing instructor-directed tasks and activities related to the course material (Bell & Kahrhoff, 2006). Active learning requires an active role of the learner in achieving new knowledge or skills and is associated with the term learning by doing (Behnsen, 2018). Students who engage with the material are more likely to understand, recall information, and use it in different contexts (Bruner, 1961). Moreover, active learning helps develop higher-order thinking skills such as analysis, synthesis, and evaluation (Rahman et al., 2022).

Reading strategies are the mental processes that readers intentionally employ to complete reading tasks (Cohen, 1986). Anderson (1991) indicated that no particular set of processing strategies guarantees success in second-language reading tasks, emphasizing the importance of employing and integrating various techniques. Koda (2005) categorized reading strategies into cognitive, metacognitive, and social-affective. Cognitive strategies involve specific cognitive activities while reading, such as word-part analysis and inference. Metacognitive strategies control cognitive processing, such as monitoring and adjusting understanding. Social-affective strategies involve interacting or cooperating with others during reading.

Active reading strategies help students engage actively with the reading material. These strategies, developed under cognitive, metacognitive, and socio-affective aspects (Koda, 2005), emphasize dynamic interaction with texts and prior knowledge, problem-solving, researching, and metacognitive skills for effective comprehension (Roast et al., 2002). The study focused on the SQ4R method, encouraging students to summarize, criticize, and relate gained information to other contexts, promoting autonomous and active learning (Masharipova & Mizell, 2021).

The SQ4R (Survey, Question, Read, Recite, Record, Review) method is a systematic reading strategy designed to enhance comprehension and retention, especially in academic contexts. The process begins with surveying the text, where students skim the material to grasp the overall structure, look at titles and subtitles, and summarize paragraphs, which helps them anticipate the content and structure of the reading material (Manz, 2002). The **Question** step involves formulating questions based on the headings and initial survey, which guide deeper engagement during the reading phase (Thomas & Robinson, 1972). In the **Read** phase, students thoroughly engage with the text, seeking answers to their questions and

promoting active learning. This is followed by **Reciting**, where students verbally summarize what they have read to enhance retention (Blerkom, 2009). The **Record** phase involves taking structured notes on key concepts, aiding memory retention and review preparation (Pauk & Owens, 2010). The final step, **Review**, sees students revisiting their notes and the text to reinforce understanding and solidify memory, which is critical for long-term knowledge retention (McDaniel et al., 2009).

Studies have demonstrated that students using the SQ4R method experience significantly improved comprehension and retention compared to peers using less structured approaches (Robinson, 1946; Taylor, 1986). This method facilitates cognitive engagement with the text, prompting students to integrate new information more thoroughly (McDaniel et al., 2009). Active involvement in generating questions and seeking answers promotes critical thinking and more profound analytical skills (Blerkom, 2009). Moreover, the SQ4R method enhances students' recall of detailed information and helps them grasp complex concepts, which is crucial for academic success in higher education (Pauk & Owens, 2010). As students consistently apply these strategies, they improve their academic performance and develop transferable skills essential for professional success and lifelong learning (Manz, 2002).

Reading comprehension is a cognitive process that involves decoding the meaning of printed or written linguistic signals (Nuttall, 1982). It includes bottom-up processing, where readers construct understanding from small units to a whole concept (Gough, 1972), and top-down processing, where readers use prior knowledge to predict and understand the text (Goodman, 1967; Smith, 1971). For second language learners, interactive cognitive processing, combining bottom-up and top-down processes, is essential for dealing with texts effectively.

Employing active reading strategies can accelerate students' reading performance, making it successful and effective. Active reading involves activating background knowledge, predicting target questions, summarizing main ideas, reflecting on understanding, and applying these strategies to new texts. These strategies, scaffolded by teachers, encourage students to become autonomous and active learners, improving their reading comprehension skills (Masharipova & Mizell, 2021).

Technology integration into reading instruction has enhanced students' reading comprehension and engagement. Digital tools like e-readers, online dictionaries, and annotation software enable interactive and multimedia-enriched reading experiences. According to O'Brien and Voss (2011), using digital texts allows for interactive features such as hyperlinks, multimedia content, and instant access to definitions and translations, which can aid in comprehension and retention of information. Additionally, educational apps and platforms can provide personalized reading experiences, allowing students to engage with texts at their own pace and at a difficult level (Chen et al., 2013).

Despite its effectiveness, the SQ4R (Survey, Question, Read, Recite, Record, Review) model has historically been less integrated with technology in educational settings, mainly due to its traditional roots in print-based learning strategies (Manz, 2002; Thomas & Robinson, 1972). This has often limited its direct application in modern education's increasingly digital learning environments. Consequently, the need arises to explore how students in the contemporary academic landscape, particularly in English for Specific Purposes (ESP) courses, adapt this traditional method to fit digital and technologically enhanced learning contexts. This investigation is crucial as integrating technology with the SQ4R method could potentially improve its accessibility and effectiveness, allowing for digital annotations, interactive questioning, and multimedia content reviews, which could significantly benefit reading comprehension and retention in ESP courses (Piotrowski, 2018; Blerkom, 2009). Therefore, examining how students incorporate the SQ4R method with digital tools in this study addresses existing practice gaps and aligns with current educational trends toward more technology-driven learning strategies.

The relationship between digital learning tools, note-taking methods, and reading comprehension has been the subject of considerable attention in recent educational research. Several studies have explored how different methods impact student performance, comprehension, and satisfaction in the context of language learning and higher education. For instance, the comparison of digital versus longhand note-taking in medical students highlighted the advantages of digital tools in terms of student satisfaction and academic performance, suggesting that digital methods provide more flexibility and interactivity. However, other studies have pointed out the drawbacks of digital reading, particularly in terms of cognitive processing, as students tend to engage less deeply with digital texts compared to traditional longhand note-taking, where physical interaction with the text might encourage better retention and understanding. This aligns with the findings from Baron (2017), who discussed the "fate of reading" in a digital world, emphasizing how digital tools might hinder the depth of engagement with text due to the ease of distraction and the nature of screen-based reading.

In the context of language acquisition, various research works have explored the role of reading strategies and metacognitive awareness in improving comprehension. Reading strategies, such as the SQ4R

method, which includes Survey, Question, Read, Recite, Record, and Review, have been explored for their effectiveness in enhancing reading comprehension in English for Specific Purposes courses. The studies indicate that incorporating technology, such as online text annotation and summarization tools, into traditional reading strategies can significantly enhance reading comprehension. These tools allow for more interaction with the text, providing immediate access to definitions, translations, and multimedia resources, which could support deeper understanding, especially in ESP contexts. Khusniyah (2020) noted how the integration of Zoom and similar platforms into SQ4R can facilitate a more dynamic and interactive reading experience, promoting both active participation and critical engagement with the text.

Moreover, research has delved into the theoretical underpinnings of reading comprehension, particularly the role of metacognition. El-Kaamy (2004) and Cohen (1986) highlighted that metacognitive awareness—being aware of one's cognitive processes—plays a crucial role in enhancing reading comprehension. The strategic use of reading strategies, coupled with metacognitive techniques, helps learners navigate complex texts more effectively. In line with this, the work of Anderson (1991) underscores the importance of individual differences in strategy use, suggesting that students' ability to tailor their strategies to the task at hand can significantly impact their reading success. Similarly, Koda (2005) offers insights into how second-language learners apply cross-linguistic knowledge to their reading strategies, underlining the importance of integrating cognitive and linguistic awareness.

Active learning strategies have also gained significant attention in the literature, with many educators advocating for their integration into reading comprehension courses. The work of Auster and Wylie (2006) and Behnsen (2018) emphasizes the need for an active, rather than passive, approach to learning. These studies suggest that learning environments should encourage students to take ownership of their learning processes, whether through collaborative tasks, interactive tools, or self-regulation. Moreover, the use of cooperative learning methods, as discussed by Johnson et al. (1998), shows that student interaction and peer support can enhance comprehension and retention, especially when students engage in tasks that require shared problem-solving or discussion.

Research on reading comprehension strategies, especially in the context of digital tools and active learning, has evolved significantly, with studies focusing on various approaches to enhance students' understanding and retention of information. Several studies have emphasized the importance of active learning, metacognitive strategies, and technological interventions in improving reading comprehension, particularly for students with diverse learning needs.

Manz (2002) provides a comprehensive review of research on teaching reading comprehension strategies to students with learning disabilities, highlighting the effectiveness of explicit instruction and tailored strategies. These findings align with those of Mikulecky (1990), who emphasizes reading as a thinking process that requires active engagement with the text, not merely decoding words. Mikulecky's framework supports the notion that comprehension is greatly enhanced when students are taught to think critically about the material they read.

The SQ4R strategy, as discussed by Masharipova and Mizell (2021), is a prominent method in promoting reading comprehension in English for Academic Purposes (EAP) students. This strategy, which involves Surveying, Questioning, Reading, Reciting, Recording, and Reviewing, has proven effective in enhancing students' ability to process and understand academic texts. In line with this, Rahman, Sahid, and Nasri (2022) discuss the positive impact of active learning strategies on academic performance, reinforcing the idea that engaging students in more dynamic and participatory learning experiences fosters deeper understanding. This aligns with Pauk and Owens (2010), who stress the importance of strategic study techniques to help students maximize their learning potential.

Meanwhile, the impact of digital tools on reading comprehension has been explored by O'Brien and Voss (2011), who argue that the rise of digital reading platforms has changed how students engage with texts. Their study underscores the potential for digital literacy to enhance comprehension, though it also warns of challenges such as distractions and surface-level engagement with digital content. This is consistent with the findings of Siegel (2023), who investigates L2 students' perceptions of digital note-taking versus pen-and-paper methods. Siegel's work suggests that while students report positive experiences with digital tools, traditional methods may still offer benefits in terms of cognitive processing and retention.

Additionally, Sun and Li (2019) examine the effectiveness of digital note-taking on students' learning across various domains of knowledge, concluding that digital tools can support declarative, procedural, and conditional learning, although the effectiveness may depend on the learner's ability to effectively integrate these tools into their study routines. This resonates with McDaniel, Roediger, and McDermott's (2009) work on test-enhanced learning, which shows that active recall techniques, whether through digital or traditional means, significantly improve knowledge retention and application.

A key concern raised by Smith (1971) and Taylor (1986) is the cognitive load imposed on learners by both reading and note-taking processes. Smith's psycholinguistic approach highlights the importance of the reader's background knowledge and the cognitive effort involved in constructing meaning from text, which is crucial for both comprehension and memory. Taylor further emphasizes that learners must develop skills in self-regulation and strategy use to maximize their performance, particularly in complex academic contexts.

Finally, studies such as those by Roast et al (2002) and Nuttall (1982) argue for a balanced approach to reading instruction, integrating both strategy-focused and content-focused methods to support learners in various stages of language acquisition. These strategies, whether deployed through digital or traditional media, provide essential support for students' development of higher-order thinking skills and reading comprehension.

## **2. Method**

A one-group quasi-experimental design with convenience sampling was employed. Participants were undergraduate students enrolled in an English for Specific course focused on reading skills at a top-ranked university in Thailand. An English for Specific Purpose course aimed to enhance students' language skills and proficiency in science and technology through exposure to authentic language in printed materials, audiovisual content, and online resources. Furthermore, it emphasized text-based tasks integrating multiple skills, focusing on reading and writing. Four instruments were utilized: a survey questionnaire on reading strategies to answer the first question, lectures, and pre- and post-tests to explore the model's effectiveness, and journals to learn how technology is integrated into their reading.

### **2.1. Survey Questionnaire on Reading Strategies**

A structured questionnaire was administered to students to gather data on their current reading strategies. The questionnaire sought to understand their strategy during the pre-, during-, and post-reading phases and their perceived effectiveness. The Active Reading Questionnaire in the present study was employed from the Active Reading Experience Questionnaire (AREQ) of Palilonis and Butler (2015). The questionnaire was fully validated and developed based on the recommendation for effective active reading. The Questionnaire comprises 30 items to assess different aspects of active reading strategies. The items cover various dimensions, such as technology in use, purposes of reading, and physical strategies. The questionnaire employs a 7-point Likert scale, which allows respondents to express their level of agreement or frequency of using specific techniques.

The reliability of the data collected in this study is evidenced by the high Cronbach's alpha values obtained from the pre-survey and post-survey measurements. Specifically, the pre-survey demonstrated a Cronbach's alpha of .97. At the same time, the post-survey achieved a slightly higher value of .98, indicating an exceptional level of internal consistency for the scales used in both surveys.

### **2.2 Lecture on Active Reading Strategies (SQ4R)**

Students were exposed to lectures focusing on active reading strategies, particularly the SQ4R method. These lectures provided students with knowledge and skills to foster engagement and comprehension during reading. At the beginning of the class, the lectures on the steps of SQ4R were introduced to the students, and each step of the strategies, such as survey, question, and read, was also reintroduced before the students started to read articles to remind and activate them to get in the process. After reading, the other three steps, recite, record, and review, were mentioned again to remind the students about the process that can help them gain the most effective results.

### **2.3 Reading Comprehension Tests**

Students underwent reading comprehension tests before and after the intervention. The results of these tests were analyzed to understand the correlation between the implementation of active reading strategies and improvements in reading comprehension.

### **2.4 Reading Journal**

Students were required to maintain a reading journal where they documented their experiences with the newly learned reading strategies. The students can use their L1 or L2 to write in a journal to prevent difficulties with linguistic barriers and how they want to express their understanding and experiences. The reading journal is required to be submitted in digital files; however, they can write on paper and take a photo to submit, take notes on digital devices such as iPads or tablets, or type it on a laptop and then save it as a file. This journal served as a qualitative tool to gauge the application and effectiveness of these strategies over time.

### **2.5 Data Collection and Analysis**

Data collection involved participants completing the reading strategies questionnaire twice, before and after the intervention. A pre-test assessed initial reading comprehension levels. Lectures on active reading

strategies preceded class reading activities. Students documented their experiences in reading journals during the treatment period—a post-test evaluated reading comprehension improvements.

Quantitative analysis involved descriptive statistics and t-tests for survey and test data, while qualitative analysis of reading journals utilized thematic analysis.

### 3. Results and Discussion

#### 3.1 Results

*Research Question 1: What active reading strategies are employed by undergraduate students in an ESP course?*

The survey results underscore the significant positive changes in study strategies following the intervention. Notably, students exhibited a marked improvement in their use of flow charts to organize material, with average scores surging from 4.33 to 4.70. This shift indicates a more adept handling of complex information structuring. Similarly, highlighting text saw average scores rise from 5.03 to 5.39, suggesting a more strategic approach to emphasizing key parts of texts. Organizing annotations into different formats also saw improvement, with scores climbing from 5.08 to 5.39, reflecting a more sophisticated note-taking and data-processing approach. The creation of practice tests increased from 4.66 to 4.89, indicating a higher level of engagement in active recall and testing. Understanding the author's purpose also saw improvement, with scores moving from 4.78 to 4.93, indicating a deeper engagement with the text and its intentions. Oral recitation of content after reading or watching increased slightly from 4.64 to 4.79, aiding retention and comprehension. Moreover, students reported more thorough surveying of chapters, with scores increasing from 4.60 to 4.82, suggesting a more comprehensive approach to reviewing structural elements of the material. These improvements underscore a significant shift toward more effective and engaged learning strategies among students. However, the t-value is 0.70, and the p-value is .24, insignificant at  $p < .05$ .

Table 1 Active Reading Strategies

Items	Pre-survey		Post-survey		-/+ diff
	M	SD	M	SD	
Make a flow chart of the material	4.33	1.45	4.70	1.58	+.37
Highlight text	5.03	1.85	5.39	2.05	+.36
Organize annotations (i.e., notes) into a different format	5.08	1.80	5.39	2.05	+.31
Create a practice test	4.66	1.40	4.89	1.72	+.23
Understand the author's purpose	4.78	1.31	4.93	1.64	+.15
Orally recite what I've read or watched after each section/main topic	4.64	1.49	4.79	1.79	+.12
Survey each chapter by reading the introductory and concluding paragraphs, headings, subheadings, visual captions, review questions, etc.	4.60	1.44	4.82	1.75	+.12
Make an outline of the material	4.64	1.56	4.70	1.67	+.06
Understand the structure of the educational material	4.64	1.40	4.70	1.69	+.06
Memorize parts of the educational material	4.67	1.42	4.72	1.44	+.05
Understand the author's stance	4.89	1.24	4.93	5.15	+.04
Make study questions	4.71	1.34	4.72	1.76	+.01
Evaluate educational material to form my own opinion	4.69	1.43	4.68	1.56	-.01
Make notes of key terms	5.16	2.18	5.15	1.93	-.01
Take general notes on paper or in the margins (not in the form of a structured outline)	5.10	1.65	5.06	1.68	-.04
Search for a specific piece of information	4.85	1.54	4.77	1.66	-.08
Record audio notes	4.17	1.58	4.08	1.84	-.09
Summarize educational material in my own words	5.08	1.76	4.96	1.83	-.12
Cross-reference information from lecture notes and information from the assigned educational materials	4.91	1.44	4.79	1.67	-.12
Mark main ideas	5.17	1.81	5.12	4.89	-.05

Comprehend what I read or watch (for example, be able to answer questions about it and discuss topics in my own words)	4.87	1.45	4.72	1.56	-.15
Make note cards	4.87	1.65	4.70	1.67	-.17
Test myself over the information	4.83	1.47	4.65	1.63	-.18
Rank my annotations (i.e., notes) in order of importance	4.98	1.56	4.77	1.83	-.21
Analyze the educational material for accuracy	4.83	1.54	4.62	1.60	-.21
Synthesize what I read or watched (i.e., combine information to see how it all fits together)	4.85	1.32	4.63	1.61	-.22
Take notes over video content	4.85	1.48	4.55	1.99	-.30
Mark parts of a video (i.e., make note of a specific point in the video timeline so you can add a note to it or easily find that point in the video later)	5.12	1.60	4.77	1.92	-.35
Save portions of a video	4.83	1.74	4.34	1.93	-.49
Take notes on a digital device (i.e., laptop, smartphone, tablet)	5.23	1.75	4.63	2.14	-.60

*Research Question 2: How does implementing the SQ4R model affect students' reading comprehension?*

The pre- and post-test results indicate a significant improvement in scores, with the pre-test average at 13.56 and the post-test average increasing to 16.34. Statistical analysis further supports this finding, as the t-value of -2.16107 and a p-value of .03282 demonstrate that the results are statistically significant at  $p < .05$ . This signifies a meaningful enhancement in the test scores following the intervention.

*Research Question 3: What are their insights on the model?*

Most of the students have positive opinions towards employing SQ4R in active reading activities, as the following examples.

*"SQ4R helped me to find the main ideas and ask myself questions before reading about what I wanted to know and what I already knew. Then, read carefully to find the answers to the questions. And also understood the author's purpose. I also reviewed to myself what I read."* – Extract 1

*"Using SQ4R benefited my reading skills effectively. Surveying, questioning, and finding the answers made me more careful and attentive to details. Taking note of the main ideas and summarizing made me understand the article's objective and story."* – Extract 2

*"SQ4R is very helpful for me. It is a technique emphasizing taking note of the answers from prior questions, summarizing the main ideas of each issue, and criticizing those topics that made me remember and understand well."* – Extract 3

Moreover, the students seem familiar with and comfortable with integrating technology into their active reading (see Figure 1). As the reading journal is required to be submitted in digital files, most of the students submitted their reading journals, which were written or recorded on digital devices such as iPads, laptops, and smartphones. A minority of the students took notes on paper, then took a photo and submitted it to Google Classroom. In addition, from the class observation, most students always used digital devices, such as smartphones, iPads, or tablets, together with some applications (Google translate, online dictionary, etc.) to integrate with their reading and the reading journals.





and metacognitive processes and also asks students to generate or write what they understand or reflect their experiences.

Moreover, the use of technology aligns with the findings of McDaniel et al. (2009), who emphasized the importance of testing and feedback in educational settings. Khusniyah (2020) employed Zoom, a video conference application, with SQ4R in reading comprehension class, and the results showed that a digital platform like Zoom provides an option as an online learning platform and gives more opportunities for teachers and students to ask and give feedback to students synchronously. Therefore, digital platforms can provide immediate feedback and more engaging, formative assessments, helping students monitor their comprehension and adjust their learning strategies accordingly.

Furthermore, technology like mobile devices can also provide students with enjoyment in learning because most of the participants in this study are the technology-user generation born and raised in the era of digital devices (Albaker, 2021). Therefore, the enjoyment of integrating digital devices in the classroom is familiar to them because they are familiar with using digital devices in daily life.

Thus, the combined use of SQ4R lectures and technology supports the development of essential academic skills and prepares students for a technologically advanced and information-rich world. This blended approach fosters a more engaging and effective learning environment, enhancing students' abilities to process and comprehend complex academic texts. This holistic method is crucial for developing proficient, autonomous learners capable of effectively navigating academic challenges and future professional demands.

#### **4. Conclusion**

Integrating SQ4R lectures and technology in educational settings has proven highly effective in enhancing students' reading comprehension. This approach adheres to established pedagogical practices and aligns with modern educational trends emphasizing digital literacy and interactive learning. Using structured reading strategies like SQ4R, complemented by technological tools, has significantly improved students' ability to engage with and retain complex material. This dual strategy enriches the learning experience and equips students with critical skills necessary for academic success and professional advancement. As educational environments evolve, incorporating innovative and evidence-based teaching methods will prepare students to meet the challenges of an increasingly complex and information-driven world.

#### **4.1 Pedagogical Implication**

Given the effectiveness of active reading strategies, educators should integrate structured approaches like the SQ4R method into curricula. Training students in these strategies can significantly improve their ability to comprehend and retain information, making them more autonomous and proficient learners. With technology's increasing role in education, it is crucial to integrate digital tools seamlessly into reading assignments. Multimedia, interactive texts, and digital annotation tools can cater to diverse learning styles and preferences, potentially increasing student engagement and comprehension.

#### **Acknowledgment**

The authors gratefully acknowledge the support of The Classroom Research Committee, Faculty Development Academy, Suranaree University of Technology.

#### **References**

- Albaker, B. A. (2021). Digital versus longhand note-taking effect on students' knowledge, satisfaction, and academic performance among medical students in Majmaah University. *P J M H S*, 15 (4), 1509-1513.
- Alptekin, C. (2002). The influence of culture on the reading comprehension of second language learners. *TESOL Quarterly*, 36(4), 413-439.
- Alptekin, C. (2002). Towards intercultural communicative competence in ELT. *ELT Journal*, 56(1), 57-64.
- and habits. *Computer and Education Open* 4 (2023).
- Anderson, N. J. (1991). Individual differences in strategy use in second language reading and testing. *Modern Language Journal*, 75(4), 460-472.
- Anderson, N. J. (1991). Individual differences in strategy use in second language reading and testing. University of California.
- Auster, E. R., & Wylie, K. K. (2006). Creating active learning in the classroom: A systematic approach. *Journal of Management Education*, 30(2), 333-353.
- Baron, N. S. (2017). *Words Onscreen: The Fate of Reading in a Digital World*. Oxford University Press.
- Baron, N. S. (2017). *Words onscreen: The fate of reading in a digital world*. Oxford University Press.

- Behnsen, A. (2018). Active learning: A brief introduction. *Journal of Education*, 18(2), 45-49.
- Bell, A., & Kahrhoff, B. (2006). Active learning in the classroom: Strategies and methods. *Journal of Education Research*, 17(3), 235-250.
- Bell, J. T., & Kahrhoff, J. (2006). Active learning handbook. *Saint Louis University, Reinert Center for Teaching Excellence*.
- Blerkom, D. (2009). Using the SQ4R method to improve academic success. *Journal of Active Learning*, 21(3), 91-99.
- Blerkom, D. L. V. (2009). Writing and reading for critical thinking. Oxford University Press.
- Blerkom, M. L. V. (2009). *College Study Skills: Becoming a Strategic Learner*. Wadsworth, Cengage Learning.
- Bruner, J. S. (1961). The act of discovery. *Harvard Educational Review*, 31(1), 21-32.
- Chen, C. M., Cheng, Y. S., & Chew, S. L. (2013). Enhancing reading comprehension with online text annotation and summarization. *British Journal of Educational Technology*, 44(2), 181-194.
- Chen, C., Lee, T., & Lin, Y. (2013). Personalized learning in a digital environment: A case study of reading comprehension. *Educational Technology & Society*, 16(2), 56-67.
- Cohen, A. D. (1986). Mentalistic measures in reading strategy research: Some recent findings. *English for Specific Purposes*, 5(2), 131-145.
- Cohen, A. D. (1986). The second language reading process: A review of the research. *Modern Language Journal*, 70(1), 50-68.
- Darling-Hammond, L., Flook, L., Cook-Harvey, C. M., Barron, B., & Osher, D. (2019). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, 24(2), 97-140.
- Dudley-Evans, T., & St John, M. J. (1998). *Developments in English for Specific Purposes: A multi-disciplinary approach*. Cambridge University Press.
- Dudley-Evans, T., & St John, M. J. (1998). *Developments in English for Specific Purposes: A multidisciplinary approach*. Cambridge University Press.
- El-Kaomy, M. T. S. (2004). Metacognition and reading comprehension: Current trends in theory and research. *Journal of Research in Reading*, 27(1), 1-12.
- Goodman, K. S. (1967). Reading: A psycholinguistic guessing game. *Journal of the Reading Specialist*, 6(4), 126-135.
- Gough, P. B. (1972). One second of reading. *Journal of Reading Behavior*, 4(4), 55-66.
- Grabe, W. (2009). *Reading in a second language: Moving from theory to practice*. Cambridge University Press.
- Johnson, D. W., Johnson, R. T., & Smith, K. A. (1998). Cooperative learning returns to college: What evidence is there that it works? *Change: The Magazine of Higher Learning*, 30(4), 26-35.
- Khusniyah, N. L. (2020). Teacher's Perception on SQ4R in English Reading Comprehension Learning Using Zoom Application. *VELES Voices of English Language Education Society*, 4(2), 231-238. <https://doi.org/10.29408/veles.v4i2.2554>
- Koda, K. (2005). *Insights into second language reading: A cross-linguistic approach*. Cambridge University Press.
- Laufer, B., & Ravenhorst-Kalovski, G. (2010). Lexical sources in the comprehension of academic texts: The role of vocabulary. *Reading in a Foreign Language*, 22(1), 94-115.
- Laufer, B., & Ravenhorst-Kalovski, G. C. (2010). Lexical threshold revisited: Lexical text coverage, learners' vocabulary size, and reading comprehension. *Reading in a Foreign Language*, 22(1), 15-30.
- Manz, E. (2002). Reading strategies for academic success: A guide for students. Pearson Education.
- Manz, E. (2002). The SQ4R reading method and its application to educational settings. *Journal of Educational Strategies*, 45(3), 102-110.
- Manz, S. L. (2002). *Teaching reading comprehension strategies to students with learning disabilities: A review of research*. *Review of Educational Research*, 72(2), 277-320.
- Masharipova, D., & Mizell, H. (2021). Enhancing EAP students' reading comprehension skills through SQ4R strategy. *Journal of Language and Education*, 7(1), 45-53.
- Masharipova, S., & Mizell, J. (2021). Active reading strategies in language learning: The SQ4R model. *International Journal of English Language Teaching*, 9(3), 30-44.
- McDaniel, M. A., Roediger, H. L., & McDermott, K. B. (2009). Generalizing test-enhanced learning from the laboratory to the classroom. *Psychonomic Bulletin & Review*, 16(1), 200-215.
- McDaniel, M. A., Roediger, H. L., & McDermott, K. B. (2009). The critical importance of learning and review techniques in memory retention. *Memory & Cognition*, 37(3), 593-602.
- Mikulecky, B. S. (1990). *Teaching reading as a thinking process*. Harper & Row.
- Mikulecky, B. S. (1990). *Teaching reading in a second language*. Addison-Wesley.
- Nuttall, C. (1982). *Teaching reading skills in a foreign language*. Heinemann Educational Books.
- O'Brien, D., & Voss, M. (2011). Reading comprehension in the digital age. *International Journal of Digital Literacy and Digital Competence*, 2(3), 25-39.
- O'Brien, T., & Voss, D. (2011). The role of digital texts in reading comprehension. *Journal of Educational Technology*, 12(4), 45-59.
- Palilonis, J. & Butler, D. (2015). Active Reading Experience Questionnaire: Development and validation of an instrument for studying active reading activities. *Journal of Interactive Learning Research*, 26(3), 271-287. Waynesville, NC: Association for the Advancement of Computing in Education (AACE). Retrieved June 23, 2024 from <https://www.learntechlib.org/primary/p/147364/>.
- Palilonis, J., & Butler, L. (2015). The Active Reading Experience Questionnaire (AREQ): Assessing active reading strategies. *Reading & Writing Quarterly*, 31(4), 328-340.

- Pauk, W., & Owens, R. J. (2010). *How to Study in College*. Wadsworth, Cengage Learning.
- Piotrowski, P. (2018). Enhancing reading comprehension through technology: Integrating SQ4R with digital tools. *Journal of Educational Technology Integration*, 7(1), 44-58.
- Rahman, M. M., Hasan, R., & Khaleque, M. (2022). The effectiveness of active learning in enhancing students' academic performance. *Journal of Active Learning*, 23(2), 115-130.
- Rahman, S. F., Sahid, S., & Nasri, N. (2022). The impact of active learning strategies on students' academic performance. *Journal of Educational Research and Practice*, 12(2), 123-138.
- Renandya, W. A., & Jacobs, G. M. (2002). Extensive reading: Why aren't we all doing it? In J. C. Richards & W. A. Renandya (Eds.), *Methodology in language teaching: An anthology of current practice* (pp. 295-302). Cambridge University Press.
- Roast, A., Harris, A., & Pinder, S. (2002). Strategies for teaching reading. *Educational Research Review*, 1(1), 3-15.
- Robinson, F. P. (1946). *Effective study*. Harper & Row.
- Siegel, J. (2023). Pen and paper or computerized notetaking? L2 English students' views
- Smith, F. (1971). *Understanding reading: A psycholinguistic analysis of reading and learning to read*. Holt, Rinehart and Winston.
- Sun, D., & Li, Y. (2019). Effectiveness of digital note-taking on students' performance in declarative, procedural and conditional knowledge learning. *International Journal of Emerging Technologies in Learning (Online)*, 14(18), 108-119.
- Taylor, A. G. (1986). *Learning to Learn: Maximizing Your Performance Potential*. Chandler House Press.
- Taylor, H. (1986). The SQ4R method and its implications for reading comprehension. *Journal of Educational Psychology*, 78(2), 88-102.
- Thomas, M., & Robinson, J. (1972). Survey, Question, Read, Recite, Record, Review: A method for improving reading comprehension. *Reading Research Quarterly*, 5(2), 115-130.
- Thomas, R. M., & Robinson, F. P. (1972). The SQ4R method: A strategy for enhancing reading comprehension. *Reading Research Quarterly*, 7(4), 431-439.