Developing a Computer Assisted Summary Writing Learning Model

Chew Chiou Sheng and Norisma Idris
Artificial Intelligence, University of Malaya, Kuala Lumpur, Malaysia
Email: cschew501@gmail.com, norisma@um.edu.my

David Loh Er Fu, Mimihayu Md Yusof, and Wan Effa Jaapar
Academy Language Studies, Universiti Teknologi Mara, Melaka, Malaysia
Email: david_loh@bdrmelaka.uitm.edu.my, {mimiyusof, waneffa}@melaka.uitm.edu.my

***Abstract*—Summary writing is a process of producing a more concise text through the process of selecting important information and deleting supporting and explanatory details from the source text. A good summary does not only depend on students ability to comprehend the source text, but also able to relate their prior knowledge in the process. Besides that, summarizing strategies are also crucial in summary writing. From a study conducted on Malaysian undergraduate students, it was found that majority of them were unable to write a good summary due to lack of prior knowledge and functional knowledge of summarizing strategies. This indicates that prior knowledge and summarizing strategies are important in summary writing. The aim of this research is to develop a summary writing learning model that incorporates prior knowledge, summarizing strategies and learning theories to enhance students' ability to produce a good summary. The proposed Summary Writing Learning (SWL) model consists of three main components; Prior Knowledge Activation (PKA), Summarizing Strategies Learning (SSL), and Summarizing (SZ). An advanced organizer is used to activate students' prior knowledge in PKA to comprehend the new text. The worked example instructional approach is used to instruct students in SSL. Moreover, a feedback sub-component is proposed in SZ to provide feedback to students on their summary strategies identification. The proposed SWL model will be a valuable contribution to educational technology specifically in summary writing.**

***Index Terms*—summary writing, reading comprehension, summarizing strategies, prior knowledge, learning theory**

I. Introduction

Secondary and tertiary institutions in ASEAN countries use summary writing as part of assessing students' ability in comprehending text in English. In the past, various studies have been conducted on summary writing. However, it appears that students remain unskilled in good summary writing. Most of the students' summary writing is a repetition of sections of the original article without a thorough understanding of it. Due to the lack of effective summarization skills, students have a negative attitude towards writing [1].

Writing summaries is one of the reading comprehension skills. To write a good summary, summarizing skills are needed. Possessing weak reading comprehension skills results in poor summarization because the ability to understand a text and identify the main idea is essential to summarization. Various studies have been conducted to assist students in improving their summarization skills. One of the key areas related to summarization skills is identifying summarizing strategies. Few researchers have focused on identifying summarizing strategies by students and teachers [2]–[4]. These studies were able to identify summarizing strategies such as Topic Sentences Selection, Deletion, Sentences Combination, Copy-paste, Off-the-subject and Paraphrase. The findings from these studies indicate that possessing efficient summarization skills help in producing good summaries. The results also show that students need to have proper knowledge of summarizing strategies. However, most of the strategies identified have not been fully integrated in summary writing instruction. Even though some of these basic strategies have been applied in teaching indirectly, some students are still unable to write good summaries [1], [3], [5], [6].

Apart from that, the previous studies conducted only emphasize how to produce a summary. They neglect the aspect of making students understand the source text. There is a relation between good understanding of the source text and good summaries. Student needs to comprehend the source text before they are able to produce a good summary. Thus, to acquire good summarization skills, reading comprehension plays an important role.

Reading comprehension is defined as the process of simultaneously extracting and constructing meaning of what is read [7]. Student have to decode what they read, make connections between what they read and their prior knowledge or background knowledge [8], [9]. Prior knowledge is formed from experiences we have had, things we have seen and heard in the past. Most of the times, students forget a previously learnt concept, thus requiring some form of simulation to trigger stored knowledge in the long term memory.

Thus, this research is aims to develop a summary writing learning model which involve prior knowledge,

Manuscript received May 25, 2017; revised November 28, 2017.

doi: 10.18178/ijlt.4.2.94-101

summarizing strategies and educational psychology theories incorporation for enhancing students' summarization ability.

II. Research Problem

Summary writing is viewed as an interesting subject by researchers. Previous works on summary writing focus on the quality of written summaries, neglecting the comprehension stage before summarizing a text. Concentrating on the written summary does not resolve the problem of proper text understanding before writing summaries. A student with good reading comprehension skills can write better summaries as compared to a student with inadequate comprehension skills. With good comprehension skills, a student can extract the main idea more effectively. Based on Rosenblatt's of Transactional Theory of Reading [10], there are some operations which occur between reading and writing that enable the student to comprehend the text more effectively through prior knowledge. An educational study conducted by Wichadee [11] shows that by applying transactional strategies, a good summary is produced with the help of prior knowledge. In almost all scenarios, however, students' prior knowledge is not activated during reading. Therefore, there is a need to activate students' prior knowledge to relate the source text to existing knowledge to ease their reading process [12].

Apart from that, researchers have shown that summarizing strategies play an important role in producing a good summary [2], [3], [13], [14]. Students have to be given proper guidelines and instructions while learning summarizing strategies. However, summarizing strategies have not been fully integrated in summary writing instruction. Furthermore, conventional method used for summary writing in classroom teaching nowadays is not effective due to the summarizing strategies and application of the prior knowledge are not focused well. Students are lacking summarizing strategies knowledge and thus it is very important for them to learn as much as possible. Apart from that, the incorporation of educational psychology learning theories in summary writing tools such as Summary Street [15] , LEA [16], Summary Assessment System [17], Online Summary Assessment and Feedback System [18], Modelling Summarization Assessment Strategies [4], Summary Sentence Decomposition Tool [3] and SUMMARULE [19] have also been neglected.

A study was conducted on 59 undergraduate students of a local Malaysian university. The main objective of the study is to investigate students' summarization ability in summary writing. The instrument for the study was a summary writing test, functional knowledge of summarizing strategies, marking rubric of summary writing and prior knowledge test. The outcome of the study is that majority of the students have poor summarization ability and it is affected by their low level knowledge of summarizing strategies and prior knowledge was inactivated.

Although a lot of research has been carried out relating to enhance students' summary writing skills, but there is very little work that has been done which dealt with prior knowledge and summarizing strategies. Students' lack of exposure in learning the summarizing strategies and activate their prior knowledge in reading the text creates countless difficulties in writing a good quality of summary. It is the root of the problem in writing especially in summary writing.

III. Literature Review

A. Summary Writing

Although a lot of research has been carried out relating to enhance students' summary writing skills, but there is very little work that has been done which dealt with prior knowledge and summarizing strategies. Students' lack of exposure in learning the summarizing strategies and activate their prior knowledge in reading the text creates countless difficulties in writing a good quality of summary. It is the root of the problem in writing especially in summary writing

Summary writing can be defined as a process to produce a more concise text by captivating the important ideas and deleting the supporting and explanatory details. This skill of summarization is important in comprehending text and hence it is even used to evaluate students' understanding in secondary and tertiary education in most Asean countries [3]. A written summary shows the relationship between the actual understanding and the original text. Summaries can be written by anyone but it requires good understanding of the main ideas and critical points in order to produce a good summary. School students are taught how to summarize the text using the step-by-step rules as follows: Reading the original text carefully is the first and most important step. Then the important sentences should be identified and similar ideas could be combined into the same sentence. The sentence structure can be altered if necessary. Finally, selected words and phrases could be rewritten as necessary so that it does not alter the meaning of the original text.

Moreover, the key to write a good summary is to combine the ideas in a text into a concise and coherent paragraph. Nevertheless, even when students follow these rules, it is difficult to differentiate the important sentences in the original text. Therefore, students have to learn relevant summarizing skills. By possessing good summarizing skills, students would develop a good understanding of the text and would be able to summarize in a much better manner. They would also be able to condense information from various textbooks, academic materials or journal articles. Although summarizing skills greatly add to the understanding of the subject matter, several students face difficulties in mastering this skill. Resulting in poor quality summaries especially from those students for whom English is not their first language [1]. As medium of tertiary education is predominantly in English, those with poor English reading and summarizing skills would experience difficulties in their English-based learning process [11]. They would not be able to fully understand the reading

and find it difficult to summarize the ideas. This would result in most of the summaries being the copied-verbatim of sections of the original text. This also raises another problem as it develops negative thinking on the learning process [1]. Thus, it is very important to learn summarizing skills which can help the students to develop their reading and summary writing skills.

Summarizing skills were initially based on summarization rules such as Deletion, Construction and Generalization [20]. These rules are currently used by researchers to develop summarizing strategies (Deletion, Topic Sentence Selection, Paraphrasing, Copy-paste, Sentence Combination, Generalization, Invention) to assist the students in improving their summarizing skills.

B. Summary Writing Process Model

The summary writing process is essential to reading and it is crucial for gathering and organizing knowledge. According to the text processing model proposed by Kintsch and van Dijk's [20] summarization process boils down to three stages:

1) Understanding the coherent text as a whole
2) Matching the meaning in context
3) Creating a new text

The globally-accepted three rules of a good summary writing strategies are the ability to delete, generalize and construct. By doing so, summarizers are able to transform from a micro structure to a macrostructure of a text. Another model by Kirkland and Saunders [21] highlights the summarization tasks in L2 (second language) context. This particular model focuses on the functions of meta-cognitive skills during the planning, assessing and repairing of an informative summary writing through the process of recursive writing.

In addition, summarization involves the process of transformation [22]. It requires frequent transformation of the ideas, which are strategically reformed to create a conceptual representation of significant ideas of the source text. Kirkland and Saunders [21] considered transformation as an important cognitive skills particularly in summary writing, after super ordination. Overall, all these models show three common stages [23]:

1) Understanding the source text;
2) Locating the major/main ideas from materials; and
3) Writing the actual summary.

However, these existing summarization models do not provide a clear focus on the entire process of summary writing. Thus, Li [23] developed a summary writing process model to address this issue. The model was aimed to cover all the strategies and processes based on the data of participants' test-taking process. The various reading and writing strategies identified in the model, may be considered in the construct of summarizing ability. This addition could result in a more valid interpretation of scores on integrated summary writing tasks.

According to Li's summary writing process model of read to write [23], it was constructed with the various mental activities and there are two major stages appeared along the process, namely reading stage and writing stage. In reading stage consisted three steps which are assess task, reflect on reading topic and read text. Meanwhile, the others four steps in writing stage are including work out text thesis, work out major ideas, put pen to paper and assess task fulfillment. In Li's model, each step comes with its own cognitive moves that serve their own purpose in reading and writing. However, throughout the discussion of all these models, there is a discrimination towards the significance of acquiring the summarizing strategies.

C. Reading Comprehension

Reading comprehension is a process of understanding a written text and deriving the intended meaning [24]. It involves the interaction of a wide range of cognitive skills and processes. When there is a reduction in the cognitive load in a reader's working memory, the reader can decode the words and phrases fluently and infer meaning from the unfamiliar vocabulary encountered. Efficient comprehension requires decoding skills and students' background knowledge on the subject matter [25].

Decoding skills can be described as the ability to apply letter-sound correspondence rules when reading words and non-words. Subject knowledge involves narrative text as well as expository text. Narrative text is driven by decoding skills while expository text is driven by subject knowledge [25]. Moreover, decoding skills was found to be related to the students' understanding of the characters, settings, actions and events in the story as represented by the students' mental model. Nevertheless, subject knowledge was concerned with the integration of the current text with the students' prior knowledge of the subject matter as described by Kintsch's Construction-Integration Model of text comprehension [26]. According to Best, Floyd, & McNamara [27], students' prior worldly knowledge played a critical role in the comprehension process and the findings concluded that prior knowledge affected the reading comprehension outcome.

D. Prior Knowledge

According to Hollingsworth & Reutzel [28], people's prior knowledge can affect the reading comprehension outcome by deterring or augmenting understanding. Lack of prior knowledge results in pathetic reading comprehension skills and declines the ability of inference generation from the text [27]. Nevertheless, acquiring prior knowledge is not an easy task and it requires systematic training so that experience can be accumulated. This requires that readers involved should study more and accumulate varied experiences. Importantly, this prior knowledge that has been accumulated should be applied while reading as it helps in providing better understanding to the text. Recht & Leslie [29], identified that high levels of prior knowledge resulted in better recognition of important ideas in the text and an improved ability to incorporate those ideas into a summary. Moreover, summary writing has also been proved to be effective in developing reading comprehension [30].

E. Reading & Writing Theory

Rosenblatt's Theory of Transactional

Transactional theory is a reading theory related to reading and summary writing. It was first introduced by Rosenblatt which states that by relating to prior knowledge in reading, students can comprehend the text that they read more effectively as the transaction is happening between the students and the text [10]. It promotes the concept of mutual exchange that occurs between the reader and the text during the process of reading. In the production of a summary, it is mandatory for students to understand the text as a whole, and in the process of doing so, it will result in a transaction occurring during reading.

F. Learning Theories

The two main fundamental theories which underpins the present study are Constructivism and Cognitivism. Further expanded theory for Constructivism is The Zone of Proximal Development (ZPD) theory, while the further expanded theory for Cognitivism is Meaningful Learning and Cognitive Load theories.

Constructivism

Constructivism considers learning as an active and constructive process. In the eyes of constructivists, a learner is an information constructor that actively constructs his/her own subjective representations of the objective reality [31]. Moreover, in constructivism, learners' recursively build knowledge that they already have rather than merely receive and store knowledge transmitted by the teacher [32]. Learning theory that based on Constructivism which is used to support the study is Vygotsky's theory of the Zone of Proximal Development [33].

Vygotsky's Theory of the Zone of Proximal Development (ZPD)

The Zone of Proximal Development (ZPD) Theory was introduced by Vygotsky in 1978. It is defined as "the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" [34]. ZPD is also regarded as the difference in what a student can do with help or without help. Vygotsky states that a student starts by following an instructor's example, gradually they would develop the ability to complete the tasks given without help [34]. Within the zone of development, an instructor or teacher provides encouragement and teaching to students to advance their individual learning until they are capable of doing it on their own.

During the execution of an action, the ZPD is look upon as a platform to carry out tasks that allow students to achieve the greatest learning effort. As suggested by Vygotsky, when a student is given a particular task in the ZPD, one way to encourage positive accomplishment is by offering assistance. Doing so pushes the students to accomplish the goal of the task on their own. Because of its many benefits, scaffolding has become a major learning feature that includes modelling a skill, providing hints or clues, and adapting material or activity [35].

Cognitivism

Cognitivism stresses the acquisition on knowledge, internal mental structures and focus on how information is received, organized, stored and retrieved by the mind [36]. It involved human's long term and short term memory. Moreover, it is based on two assumptions: 1) memory system is an active, organized information processor; 2) prior knowledge plays an important role in learning. The two learning theories that are based on Cognitivism which are used to support the study are the Ausubel's theory of Meaningful Learning and Sweller's theory of Cognitive Load.

Ausubel's Theory of Meaningful Learning

Meaningful Learning Theory was introduced by Ausubel in 1963. Ausubel stated that Meaningful learning occurs when new information is related to prior knowledge. Ausubel also suggested using the advance organizer as a mechanism in linking new information or concepts with existing related ideas. Based on Ausubel's Meaningful Learning Theory, Joseph Novak introduced Concept Mapping strategy in 1972. He stated that a concept map can be used to represent students' knowledge in a hierarchical structure of concepts to relate new information to ideas that the students already know. Concept mapping can be used as a learning tool to facilitate meaningful learning as it helps to organize and structure knowledge [37]. Furthermore, concept mapping strategy is an advance organizer which can be used to help students to organize their ideas in a network of relationships and link the new knowledge to their prior knowledge [38]. According to Korur, Toker, & Eryılmaz [39], the integration of new and existing knowledge can be achieved and meaningful learning is carried out when the input information is in the visual format.

Sweller's Theory of Cognitive load

According to the Cognitive Load Theory by Sweller [40], learning is most effective when it is aligned with human cognitive architecture. The structure of human cognitive architecture includes schemas; a combination of elements, that make up an individual's knowledge base. It is acquired over a lifetime of learning and experience. Ones' schema explains the difference between an expert and a novice.

On the other hand, Sweller [40] emphasizes that long term memory a component of "sophisticated structures that enables us to perceive, think and solve problems," rather than a group of rote learned facts. In order for learning to be effective, a change in the schematic structures of long term memory is important. It allows the student to become more familiar with the material, thus, increasing the efficiency of the working memory. From an instructional perspective, information contained in instructional material is first processed by the working memory. This directly increases the working memory load. However, for schema acquisition to occur, instruction should be designed to reduce working memory load.

The main concern of the Cognitive Load Theory is to reduce working memory load to facilitate changes in long-term memory associated with schema acquisition. Thus, in designing or modelling learning materials, the

cognitive load of the student must be considered and kept at a minimum during the learning process. To reduce cognitive load of the human brain, a right choice of instruction is needed. The reduction in the cognitive load of a reader's working memory, enables the reader to decode words and phrases effectively and understand the text better. Worked example is one of the instructional approaches that can be used to provide clear instruction to students while learning. In addition, social interactions and guided learning within the zone of proximal development contributes to cognitive development [34].

G. Discussion on the Theories

There are a few interactions between reading comprehension and summary writing that need to be emphasized. First, there is always a transaction happening between students' prior knowledge and text during comprehend the text. Next, to obtain meaningful meaning from the new knowledge (new text), students have to activate their prior knowledge to facilitate comprehension of text as prior knowledge does positively affects understanding and learning [41], [42]. Moreover, higher prior knowledge will also lead to higher level of reading comprehension [43]. After understanding the text, students can then proceed to summary writing. Finally, to enable students to learn effectively during the summarization process, the cognitive load needs to be reduced and scaffolding should be provided within the zone of proximal development. Scaffolding assists students in honing their learning skills until they are capable of doing it on their own. Thus, a summary writing learning model was proposed based on all of the points discussed above.

IV. Design of the Learning Model

From the findings of the literature review and investigation on students' summarization ability in summary writing, the limitation of previous researches and the problems encounter by students can be categorized as follows:

1) Lacked of the learning theories incorporation in existing summary writing tools.
2) Neglected the role of prior knowledge and summarizing strategies in summary writing.
   - Difficulty in text understanding: inactivated prior knowledge.
   - Lacking the proper knowledge of summarizing strategies.

A model that can address these problems needs to be developed so as to improve students' summary writing ability. To formulate the proposed model, detail study on the methods of instruction for summarizing strategies learning and prior knowledge activation are required. The influence of learning theories towards the formulation of the model also need to be considered as the model is related to learning.

For the first category of problem, there are four theories are proposed to be incorporated in the model such as Rosenblatt's Transactional theory of Reading and Writing, and the learning theories of Ausubel's Meaningful Learning, Vygotsky's Zone of Proximal Development (Constructivism) and Sweller's Cognitive Load (Cognitivism). Transactional and Meaningful Learning theories deals with how does the new knowledge is transact with prior knowledge in order to get the meaningful meaning of text in the facilitation of comprehension. The influence of Cognitive Load theory is required to reduce the cognitive load in summarizing strategies learning as it involved learning. Moreover, the Zone of Proximal Development theory which acts as a scaffolding for students will be integrated to ease their learning process in the whole learning stage before they are able to learn independently.

For the second category of problem which is inactivated prior knowledge and lacking the proper knowledge of summarizing strategies. Advance organizer is proposed for prior knowledge activation and worked example instructional approach is proposed for summarizing strategies learning. Through the correct use of the learning theories and instructional approach in the learning of summary writing, the students' prior knowledge can be activated in reading comprehension and a meaningful learning can be achieved. Hence, their summarization ability can be improved.

The general outline of the proposed model that relates these elements is given in Fig. 1.

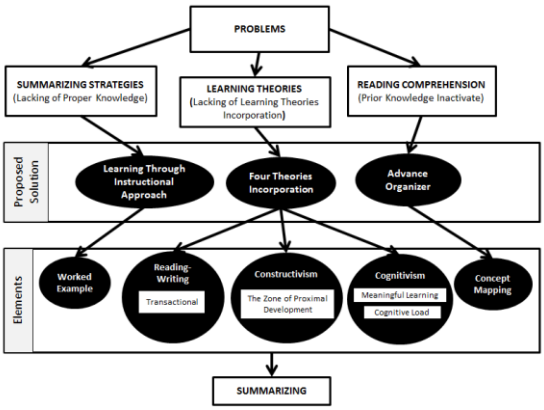

Figure 1. Problems and proposed solutions

V. The Summary Writing Learning Model

Based on the theories incorporation, and instructional approach described in the previous sections, the Summary Writing Learning (SWL) model is formulated. As shown in Fig. 2, the proposed model comprises three main stages which are i) Reading Comprehension; ii) Strategies Modelling; and iii) Self-Writing stages.

In the Reading Comprehension stage, it is focus on how to activate the students' prior knowledge to comprehend the text easier. Prior Knowledge Activation (PKA) component will be implemented in this stage and a type of scaffolding such as advance organizer will be provided to activate the prior knowledge in order to obtain a meaningful meaning from reading

Strategies Modelling stage is focusing on Summarizing Strategies Learning (SSL) component which comprises two main parts. The first part is on the introduction of the

type of summarizing strategies and the second part is on teaching and delivering the summarizing strategies knowledge to students in using worked example instructional approach.

The students who had undergone the learning process in Reading Comprehension and Strategies Modelling stages will then proceed to the last stage which is Self-Writing stage. Self-Writing stage focus on Summarizing (SZ) component where students have to do the summarizing by themselves. Feedback sub-component will be provided to students in the strategies identification, which students can evaluate and improve their writing without the intervention of teachers.

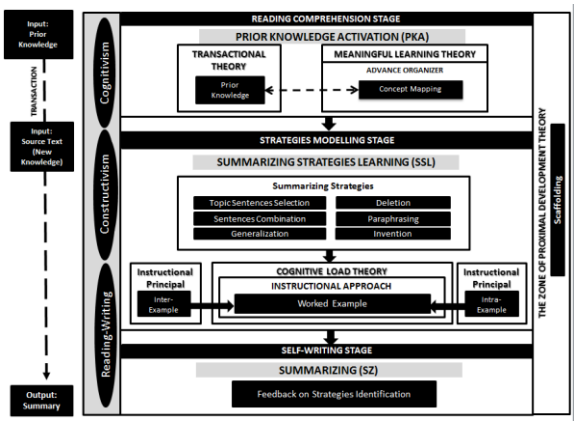

Figure 2. The proposed summary writing learning model

The theories that incorporated in Prior Knowledge Activation component are Rosenblatt's Transactional, Ausubel's Meaningful Learning and Vygotsky's The Zone of Proximal Development theories. Furthermore, SSL component is developed based on the integration of Cognitive Load and The Zone of Proximal Development theories.

For the technology part, the PKA and SSL components are proposed to be developed as a Computer Assisted Learning system. Worked example is used as an instructional approach to teach the summarizing strategies and there are two principles integrated on it such as Inter-Example and Intra-Example. Furthermore, concept mapping is proposed to be used as an advance organizer tool to activate students' prior knowledge in text reading. The last component, Summarizing component is integrated with Abdi et al. [2], the Summarizing Strategies Identification based on Linguistic Knowledge (ISSLK) algorithm that used to identify the used summarizing strategies.

VI. Conclusion

The suggested SWL model is aimed at contributing to educational technology in the acquisition of summary writing skills. The model is based on the belief that reading-writing and educational psychology theories (transactional, meaningful learning, cognitive load and the zone of proximal development) are both significantly important.

The SWL model provides scaffolding and assistance to students in the Zone of Proximal Development in order for them to be able to write the summary independently. As stated by Vygotsky, scaffolding has to be provided to students before they are able to learn independently. Furthermore, teaching students with the knowledge of summarizing strategies via worked example and enhance their reading comprehension skills by activating their prior knowledge enable them able to learn the strategies more efficiency and comprehend the new text more easily.

The proposed model is correspond to the Rosenblatt's transactional theory and Ausuble's Meaningful Learning theory which stated that by applying prior knowledge, a better understanding on the new text can be obtained. Finally, feedback also provided to students in the strategies identification, which students can evaluate and improve their writing without the intervention of teachers.

The primary concern of this research is to enhance students' summarization ability. The SWL model approaches this issue by presenting the appropriate learning process of summary writing, appropriate instructional approach and lastly to enhance the learning process. The SWL model will be developed in technology based environment which incorporated natural language processing tool. In this era of technology, there are a lot of educational system have been built in order to speed up the learning process. In fact, the use of computers in school indicates that the status of education today is improving and moving forward. Thus, the SWL model is proposed to be developed with the integration of technology and aim to contribute to educational technology.

References

[1] S. Wichadee, "Developing reading and summary writing abilities of EFL undergraduate students through transactional strategies," *Res. Educ.*, vol. 92, pp. 59–71, 2014.

[2] A. Abdi, N. Idris, R. M. Alguliyev, and R. M. Aliguliyev, "An automated summarization assessment algorithm for identifying summarizing strategies," *PLoS One*, vol. 11, no. 1, p. e0145809, 2016.

[3] N. Idris, S. Baba, and R. Abdullah, "Identifying students' summary writing strategies using summary sentence decomposition algorithm," *Malaysian J. Comput. Sci.*, vol. 24, no. 4, pp. 180–194, 2011.

[4] B. Lemaire, S. Mandin, P. Dessus, and G. Denhière, "Computational cognitive models of summarization assessment skills," in *Proc. 27th Annu. Conf. Cogn. Sci. Soc.*, 2005, pp. 1266–1271.

[5] K. McDonough, W. J. Crawford, and J. De Vleeschauwer, "Summary writing in a Thai EFL university context," *J. Second Lang. Writ.*, vol. 24, no. 1, pp. 20–32, 2014.

[6] E. Wood, P. H. Winne, and P. A. Carney, "Evaluating the effects of training high school students to use summarization when training includes analogically similar information," *J. Lit. Res.*, vol. 27, no. 4, pp. 605–626, 1995.

[7] K. Nandhini and S. R. Balasundaram, "Use of genetic algorithm for cohesive summary extraction to assist reading difficulties," *Appl. Comput. Intell. Soft Comput.*, vol. 2013, pp. 1–11, 2013.

[8] D. P. Ausubel, "Cognitive structure and the facilitation of meaningful verbal learning," *J. Teach. Educ.*, vol. 14, no. 2, pp. 217–222, 1963.

[9] A. Gurses, C. Dogar, and K. Gunes, "A new approach for learning: interactive direct teaching based constructivist learning (IDTBCL)," *Procedia - Soc. Behav. Sci.*, vol. 197, pp. 2384–2389, 2015.

[10] L. M. Rosenblatt, "Writing and reading: The transactional theory," *Read. Writ. Connect.*, vol. 20, pp. 153–176, 1988.

[11] S. Wichadee, "Using transactional strategies to improve English reading comprehension and summary writing abilities of students in english for arts and design course," *Journal of Applied Sciences*, vol. 12, no. 22, pp. 2326-2331, 2012.
[12] D. P. Ausubel, "The use of advance organizers in the learning and retention of meaningful verbal material," *J. Educ. Psychol.*, vol. 51, no. 5, pp. 267–272, 1960.
[13] R. M. Hosseinpur, "The impact of teaching summarizing on EFL learners' microgenetic development of summary writing," *J. Teach. Lang. Ski.*, vol. 5, no. 1, pp. 71–90, 2015.
[14] L. Y. Ke and M. Hoey, "Strategies of writing summaries for hard news texts: A text analysis approach," *DISCOURSE Stud.*, vol. 16, no. 1, pp. 89–105, 2014.
[15] D. Wade-Stein and E. Kintsch, "Summary street: Interactive computer support for writing," *Cogn. Instr.*, vol. 22, no. 3, pp. 333–362, 2004.
[16] I. Zipitria, A. Arruarte, and J. A. Elorriaga, "LEA: A summarization web environment based on human instructors' behaviour," in *Proc. 8th IEEE Int. Conf. Adv. Learn. Technol.*, 2008, pp. 564–568.
[17] Y. He, S. C. Hui, and T. T. Quan, "Automatic summary assessment for intelligent tutoring systems," *Comput. Educ.*, vol. 53, no. 3, pp. 890–899, 2009.
[18] Y. T. Sung, C. N. Liao, T. H. Chang, C. L. Chen, and K. E. Chang, "The effect of online summary assessment and feedback system on the summary writing on 6th graders: The LSA-based technique," *Comput. Educ.*, vol. 95, pp. 1–18, 2016.
[19] A. Abdi, N. Idris, and C. S. Chew, "SUMMARULE: Relevance detection & summarizing strategies identification tool," in *Invention, Innovation & Design Exposition*, 2016.
[20] W. Kintsch and T. A. Van Dijk, "Toward a model of text comprehension and production.," *Psychol. Rev.*, vol. 85, no. 5, pp. 363–394, 1978.
[21] M. R. Kirkland and M. Saunders, "Maximizing student performance in summary writing: Managing cognitive load," *TESOL Q.*, vol. 25, no. 1, pp. 105–121, 1991.
[22] S. Hidi and V. Anderson, "Producing Written Summaries: Task Demands, Cognitive Operations, and Implications for Instruction," *Rev. Educ. Res.*, vol. 56, no. 4, pp. 473–493, 1986.
[23] J. Li, "Modeling the process of summary writing of Chinese learners of English as a foreign language," *Irish Educ. Stud.*, vol. 35, no. 1, pp. 73–100, 2016.
[24] G. Wolley, *Reading Comprehension: Assisting children with Learning Difficulties*, New York: Springer, 2011.
[25] R. M. Best, R. G. Floyd, and D. S. McNamara, "Differential competencies contributing to children's comprehension of narrative and expository texts," *Read. Psychol.*, vol. 29, no. 2, pp. 137–164, 2008.
[26] W. Kintsch, "The role of knowledge in discourse comprehension - A construction integration model," *Psychol. Rev.*, vol. 95, no. 2, pp. 163–182, 1988.
[27] R. Best, Y. Ozuru, R. Floyd, and D. McNamara, "Children's text comprehension: Effects of genre, knowledge, and text cohesion," in *Proc. 7th Int. Conf. Learn. Sci.*, pp. 37–42, 2006.
[28] P. M. Hollingsworth and D. R. Reutzel, "Prior knowledge, content-related attitude, reading comprehension testing mathewson's affective model of reading," *J. Educ. Res.*, vol. 83, no. 4, pp. 194–199, 1990.
[29] D. R. Recht and L. Leslie, "Effect of prior knowledge on good and poor readers' memory of text," *J. Educ. Psychol.*, vol. 80, no. 1, pp. 16–20, 1988.
[30] M. Marzec-Stawiarska, "The influence of summary writing on the development of reading skills in a foreign language," *System*, vol. 59, pp. 90–99, 2016.
[31] A. K. Bednar, D. Cunningham, T. M. Duffy, and J. D. Perry, "Theory into practice: How do we link," *Constr. Technol. Instr. A Conversat.*, pp. 17–34, 1995.
[32] M. Ben-Ari, "Constructivism in computer science education," *ACM SIGCSE Bull.*, vol. 30, no. 1, pp. 257–261, 1998.
[33] W. H. Wu, W. Bin Chiou, H. Y. Kao, C. H. Alex Hu, and S. H. Huang, "Re-exploring game-assisted learning research: The perspective of learning theoretical bases," *Comput. Educ.*, vol. 59, no. 4, pp. 1153–1161, 2012.
[34] L. S. Vygotsky, "Mind in society: The development of higher psychological processes," *Mind Soc. Dev. High. Psychol. Process.*, vol. Mind in So, p. 159, 1978.
[35] C. Copple and S. Bredekamp, *Developmentally Appropriate Practice in Early Childhood Programs Serving Children from Birth Through Age 8*, ERIC, 2009.
[36] P. A. Ertmer and T. J. Newby, "Behaviorism, cognitivism,constructivism: Comparing critical features from an instructional design perspective," *Perform. Improv. Q.*, vol. 26, no. 2, pp. 43–71, 2013.
[37] J. D. Novak and A. J. Cañas, "The theory underlying concept maps and how to construct and use them," *IHMC C.*, pp. 1–36, 2008.
[38] N. Farshi and M. Tavakoli, "The effects of concept mapping strategy and aural vs . written prompts on writing test performance under different planning conditions," *Journal of Teaching Language Skills*, vol. 6, no. 2, pp. 1–25, 2014.
[39] F. Korur, S. Toker, and A. Eryılmaz, "Effects of the integrated online advance organizer teaching materials on students' science achievement and attitude," *J. Sci. Educ. Technol.*, 2016.
[40] J. Sweller, "Cognitive load during problem solving: Effects on learning," *Cogn. Sci.*, vol. 12, no. 1, pp. 257–285, 1988.
[41] P. A. Alexander, J. M. Kulikowich, and S. K. Schulze, "The influence of topic knowledge, domain knowledge, and interest on the comprehension of scientific exposition," *Learn. Individ. Differ.*, vol. 6, no. 4, pp. 379–397, 1994.
[42] L. Mason, N. Ariasi, and A. Boldrin, "Epistemic beliefs in action: Spontaneous reflections about knowledge and knowing during online information searching and their influence on learning," *Learn. Instr.*, vol. 21, no. 1, pp. 137–151, 2011.
[43] F. Calisir and Z. Gurel, "Influence of text structure and prior knowledge of the learner on reading comprehension, browsing and perceived control," *Comput. Human Behav.*, vol. 19, no. 2, pp. 135–145, 2003.

Chew Chiou Sheng is a Ph.D. candidate in Faculty of Computer Science & Information Technology at University of Malaya. His main research areas and interest include second language learning, summary writing, summarization strategies, tutoring technologies, educational technologies and natural language processing.

Norisma Idris is a Senior Lecturer at the Department of Artificial Intelligence, University of Malaya. Her main research areas and interest include second language learning, summarization strategies, text summarization and natural language processing.

David Loh Er Fu is an Associate Professor in the Academy of Language Studies at University Technology MARA. He has 32 years of experience in teaching English for Specific Purposes (ESP), English for Occupational Purposes (EOP), English for Academic Writing, English for Critical Academic Reading, TESL degree program and English Proficiency Courses. His research interests include Language Testing and Evaluation, Reading Comprehension Assessment and Teaching and Learning in English as a Second Language.

Mimihayu Md Yusof is a Lecturer in the Academy of Language Studies at University Technology MARA, Jasin Campus Melaka. She has 17 years of experience in teaching English for Occupational Purposes (EOP), English for Academic Writing, English for Critical Academic Reading and English Proficiency Courses, for both Diploma and Degree levels. Her research interests include

Teaching and Learning in English as a Second Language, Language Testing and Evaluation, as well as Sociolinguistics.

Wan Effa Jaapar is a Lecturer in the Academy of Language Studies at University Technology MARA, Jasin Campus Melaka. She has 10 years of experience in teaching English for Occupational Purposes (EOP), English for Academic Writing, English for Critical Academic Reading and English Proficiency Courses, for both Diploma and Degree levels. Her research interests include Teaching and Learning in English as a Second Language, semiotics, as well as Sociolinguistics.

