# A Concept Attainment Model Using Cloud-Based Mobile Learning to Enhance the Mathematical Conceptual Knowledge of Undergraduate Students

Anuchit Anupan and Benjamas Chimmalee

***Abstract*—The COVID-19 situation has affected the instructional process, with both students and instructors having to adapt to the conditions that have emerged. The inclusion of online tools as part of teaching and learning is imperative, especially in mathematics courses, in order to provide knowledge and to create a learning environment as close as possible to face-to-face learning. This study focuses on the mathematical conceptual knowledge of undergraduate students using a concept attainment model. This consists of a three-phase learning process involving the presentation of information and conceptualization, a conceptual comprehension test, and an analysis of thinking strategy. It also features the implementation of cloud-based mobile learning features, including cloud learning devices, cloud learning services, and cloud learning environments as the components of the proposed instruction model. The model was evaluated by experts before being used to investigate the mathematical conceptual knowledge of undergraduate students and how pre-test scores differ from post-test scores. Descriptive statistics and t-test were used to analyze the data. The results revealed that the overall scores for the suitability of the model indicate that this approach is most suitable, and that students learning through a concept attainment model using cloud-based mobile learning obtain a higher post-test score in mathematical conceptual knowledge compared to their pre-test score, at a level of .05 statistical significance. The framework of this study can be useful for mathematics instructors or others educators when it comes to applying it in order to develop students in mathematics contexts.**

***Index Terms*—Cloud computing, mathematical conceptual knowledge, cloud-based mobile learning, undergraduate students.**

## I. Introduction

This is the age of information technology. Nowadays, students need to learn about events that have happened. As the change that has impacted on the traditional social and educational structures, technology affects human life and has also played a significant role in educational policy [1]. In modern education it is necessary to have an instructional design that emphasizes the skills needed in the 21st Century, and is suitable for students.

Mathematics is a subject that contributes to the advancement of science and technology, offering the tools for expressing ideas. Advances arise from the inventions of science, which in turn require mathematical knowledge [2]. The nature of mathematics is abstract. It can be characterized as a systematic structure which consists of undefined terms, definitions, axioms and theorems [3]. Instructors often emphasize the abstract content, without focusing on ensuring that students understand. Therefore, it may be difficult for them to understand lesson points. Mathematics involves thinking, and concepts are the foundations of an idea or opinion produced by thinking. Human beings cannot think without a fundamental concept, because concepts contribute to determining rules and principles, and being able to solve problems. Concepts are therefore important for teaching and learning mathematics [4]. Concepts are also tools that help communicate meaning that will make interaction among people more achievable [5], [6]. Therefore, the perspective of students on mathematics is a difficult subject. In order to improve mathematics instruction, there should be a student-centered approach by encouraging students to think and solve problems by themselves, through an exploration of various technological media. This corresponds to [7], who finds that students learn best when they have an opportunity to think and practice, which will eventually lead to the acquisition of problem-solving skills and conceptual knowledge. The principles of teaching mathematics in general should provide teaching and learning in accordance with nature, philosophy and the principles of mathematics [5]. Teachers must teach students to think and gain understanding from thinking, using the ideas and questions that students wonder about in discussions to come up with a variety of ideas to reach a mathematical conclusion [8]. The common problems during learning in class not only focus on mathematical ability in primary and secondary students, but also the performance of undergraduate students when it comes to communicating mathematical principles and reasoning mathematical methods [9].

As in [10] suggest a conceptual learning approach to help students pick up rules and principles from a variety of examples, and thus to draw mathematical concepts and conclusions, namely: the concept attainment model. The principle of this model is a Q&A between students and teachers in which the teacher presents a framework of ideas that lead the students to a concept [11]. Following [12], the concept attainment model is as an inductive learning model and also enhances students' high-order thinking skills. It is a process of teaching and learning strategy that is suitable for the development of concepts which teachers should consider implementing [13].

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As technology and social conditions have made rapid progress, they have also affected the education industry. Nowadays, everyone can communicate via wireless networks or mobile devices, and the educational community uses this strength to adapt teaching and learning to be more effective and to increase the motivation to learn [14]. Information and communication technology is used as an integral part of life where the Internet is accessible to anyone with a digital device. The Internet system is an important factor in teaching and learning at the Education 4.0 age. Many educational institutions use information technology systems as part of their organization management, including in the classroom [15], [16]. Online learning is, therefore, a popular alternative to traditional learning among both students and teachers [17].

The expansion of educational technology has been developed in teaching and learning to support mobile devices and online learning. Many researches have taken an interest in the advantages of various mobile devices in the classroom, which affect the interest of students and enhance the efficiency of the entire teaching process [18]. Technology – and, in particular, cloud computing– has become increasingly important in connecting various data. These changes have obviously affected the educational needs of modern society [15]. Instructors, therefore, should adjust their teaching approaches in accordance with the social context.

Mobile learning is the application of information communication technology in education. Students study through a mobile device with an Internet connection and can learn anywhere, anytime. Mobile learning is considered a channel to support learning interactions – i.e., content, collaboration and communication – and to solve problems [19]. Accordingly, one advantage of mobile learning is that everyone can communicate with each other via a wireless network through their mobile devices, fostering their study motivation and a positive attitude towards mobile learning [20]. The online learning approach in mathematics allows students to explore their thinking processes and express their own concepts [21]. However, mobile learning is limited in terms of memory and learning resources [22].

Cloud computing is the sharing of resources over a network. A computer system operates on a computer network or the Internet. It works as network-based resource-sharing computing that provides the sharing of resources to users on demand [23]. Most of the cloud computing services are in the form of web applications that allow users to manage their services conveniently through a web browser [24]. Students can access various communication technologies as tools to search for knowledge and save it to any mobile device, such as a mobile phone, tablet or computer [25], [26]. A great deal of research is interested in the advantages of various mobile devices in the classroom, how they affect the interest of the students and enhance the efficiency of the entire teaching process [18]. It has become increasingly apparent that technology is being developed to support mobile devices and support online learning. Cloud computing is also prominent in connecting various data. These changes have obviously affected the educational needs of modern society and instructors should adjust their teaching approaches accordingly.

Mobile learning with cloud computing technology or cloud-based mobile learning is a new approach to learning organization. It is a kind of learning management that combines mobile learning and cloud computing, which is another step in the development of information technology applications and communication, along with education management [27]. Following [28], cloud computing promotes connections and prevents the loss of data, including learning materials and teacher-student interactions. Due to students nowadays preferring to communicate using mobile devices through online social networks, mobile cloud learning in the mathematics classroom should help students to share their knowledge and experiences easily, which allows them to develop better learning behaviors. It also helps to increase flexibility and their enjoyment of learning [29], [30]. Moreover, college students tend to use social media and are accustomed to using mobile devices [31]. Due to the pandemic, the concept of online learning, including mobile learning, has been increasingly adopted and applied in mathematics learning.

Along with the changes in the social context, technology has become increasingly involved in teaching and learning. Various learning platforms have had to change accordingly. There are relatively few studies on the integration of cloud technology tools with mathematical teaching theory. Due to the change in teaching pedagogy, mobile learning and cloud-based tools are deployed to adjust how the instruction takes place.

Some of the significant advantages of cloud technology in instructional processes are that it stimulates students to engage in active learning, and interact with others in their activities via cloud-based tools [25], [26]. Moreover, cloud technology provides tools for mathematics activities such as opportunities for presentations, exploration of the relationships between related concepts, discussions, presentations and collaboration [27], [30] which correspond to approach of concept attainment model. As mentioned above, the research questions associated with this study are how appropriate this approach is for implementation in the classroom in the form of an online learning environment, and how it influences students' conceptual knowledge in mathematics.

In this study, a concept attainment model employed with the use of cloud-based mobile learning features, including cloud learning devices, a cloud learning service, and cloud learning environments is proposed, and we aim to study the mathematical conceptual knowledge of undergraduate students, as a result of this proposed approach.

The rest of this paper is organized as follows. Section II gives a literature review. It introduces the related background, including the characteristics of providing services in cloud computing, cloud-based mobile learning, the concept attainment model and mathematical conceptual knowledge. In Section III, the methodology of this study and a concept attainment using cloud-based mobile learning are presented. The results are given in Section IV, and the discussion and conclusion appear in the final section.

## II. Literature Review

### A. The Characteristics of Providing Services on Cloud Computing

Educational cloud services involve all the websites dealing with cloud computing technology. These can be used as tools to support and promote mathematics teaching and learning activities [15]. Cloud computing services allow various kinds of terminals to access resources via a browser. The characteristic of cloud computing services is that it is a new, alternative way that has been developed to divide the resource infrastructure stored in phones, computers and other electronic devices [32]. Therefore, the application of a cloud-based service relating to mathematics must be properly planned. The learning platforms relating to mobile mathematics learning must be implemented under a network environment [33], due to the fact that most models of mathematics teaching need to be implemented on such a platform.

### B. Cloud-Based Mobile Learning in Mathematics

Mobile cloud computing is a system whereby data processing and data storage are performed outside mobile devices [34]. Mobile learning (M-Learning) is one of the applications of the mobile cloud. It is a combination of the mobile computing and e-Learning [35]. The management of mobile learning in conjunction with cloud technology, involves the following cloud computing technology services [20], [36], [37]:

1) Infrastructure as a Service (IaaS). This is a service for both students and instructors in terms of infrastructure resources that are on virtual systems, without the user having to invest in such resources themselves.
2) Platform as a Service (PaaS). This is a system service for supporting application development, system testing and the development of application management services. The user can adjust the resource usage size according to the size of the instruction set.
3) Software as a Service (SaaS). This is the provision of software or applications that are available because processing will be performed by the service provider. Therefore, users can use the network via the Internet without installing applications on their devices.

Following [38], it was found that online mathematics education tools can be used to support students' problem-solving abilities, increase their understanding of mathematical concepts, and also provide a variety of features for presenting students' mathematical representations. The component of mobile learning is given in Table I.

TABLE I: COMPONENT OF MOBILE LEARNING

| | [39] | [40] | [37] | [30] | [41] | [42] |
|---|---|---|---|---|---|---|
| Resources | ✓ | | ✓ | | ✓ | |
| Calculation display | | ✓ | | | | ✓ |
| Teaching material | | | ✓ | | ✓ | ✓ |
| Exchange | ✓ | | ✓ | | ✓ | |
| Interaction | ✓ | | ✓ | | ✓ | |
| Content-based records | | | | ✓ | | |
| Sound | | | | ✓ | | |
| Video documents | | | ✓ | ✓ | | |
| Discussion | ✓ | | ✓ | | | ✓ |
| Surveys<br>Assignments | ✓ | | | | | |
| Promote collaborative learning environments | | | ✓ | | | ✓ |

Lakshmi and Dhanalakshmi [30] suggest the benefit of the consistent use of mobile technology in a mathematics course. It will help students improve their particular skills, as well as encouraging the development of mobile learning applications. Cloud network tools and cloud services can be used to support mathematics learning. There has been a move towards the use of online tools to benefit higher education in mathematics. Examples of programs or mathematical software for a specific purpose include Maple Net, MATLAB web-server, WebMathematica, Calculation Laboratory, and GeoGebra [43]-[45]. The influencing factors facilitated on a mobile mathematics teaching platform based on cloud computing were analyzed, as presented in Table II.

TABLE II: THE INFLUENCING-FACTORS FACILITATED ON A MOBILE MATHEMATICS TEACHING PLATFORM BASED ON CLOUD COMPUTING

| | [39] | [41] | [46] | [15] | [16] |
|---|---|---|---|---|---|
| Create good atmosphere for students before learning | ✓ | ✓ | | | |
| Interesting mathematics content /materials and practices | | ✓ | | ✓ | ✓ |
| Difficult mathematics knowledge points should be visualized | | ✓ | | | ✓ |
| Simulating of students' thinking by advanced questions | | | ✓ | | |
| Feel fun of independently exploring and learning mathematics knowledge | | | ✓ | ✓ | |
| The use of computer visualization of mathematical knowledge | ✓ | | ✓ | | ✓ |
| Discussion /social interaction and exchange | ✓ | ✓ | | ✓ | ✓ |

A brief summary of architecture of the cloud-based mobile learning includes three main groups [20], [37]:

1) Cloud learning devices,
2) Cloud learning services,
3) Cloud learning environments.

From the point of view of the pedagogical literature, little scientific research has been published. Most of the students' behaviors are not only using mobile devices for communication but also for academic work [16].

### C. Concept Attainment Model

Joyce and Weil developed a concept attainment model based on the ideas of Bruner, Goodnow and Austin [10]. They believed that this model focused on ways to create an intrinsic human drive to understand science by exploring, organizing and developing language to express relevant knowledge and ideas [47].

The concept attainment model is an inductive model for teaching concepts with the principles and objectives of the model, to help students understand the concepts of lesson

contents and define concepts themselves [12], [48]. It is one of the learning models that focus on the development of cognitive domains [49]. Angraini and Wahyuni [13] suggest that such learning models can be adapted to students of all ages. Additionally, this learning model is also suitable for teaching that places an emphasis on understanding and learning new concepts. Accordingly, students practice their inductive thinking abilities, critical thinking skills and other high-level thinking skills [50], [51].

As students learn concepts from analytical thinking and a variety of examples, the direct result that students will receive is an understanding of that concept and new conceptualization skills that can be used to continue to understand other new concepts. Similarly, it also helps to develop inductive reasoning skills [52].

The stages of the concept attainment model, according to Arends [53], are as follows: 1) planning and creating a concept lesson, 2) teaching, 3) organizing the learning environment, and 4) assessment. Lasley and Matczynski [54] suggest four steps in the concept attainment model: 1) identification of concept, 2) the provision of an example, 3) making an assumption, 4) closure and 5) application. According to Smith and Ragan [55], the four steps of the concept attainment model consist of 1) introduction, 2) teaching, 3) conclusion, and 4) assessment. Following [56], there are three stages: 1) presentation of information and conceptualization, 2) conceptual comprehension test, and 3) analysis of thinking strategy. The learning process based on the concept attainment model according to [56] was adopted in this study. The syntax of each stage is described in Table III.

The concept attainment model has been adopted as a practical learning model by researchers. Aningsih and Asih [52] found that the understanding of mathematical concepts in terms of students' curiosity had improved by using the concept attainment model. Similarly, Nainggolan [57] found that students' conceptual understanding of mathematics was improved by the concept attainment model. Angraini and Wahyuni [13] found that the mathematical critical thinking abilities of students who studied with the concept attainment model were higher than students who studied according to conventional learning.

TABLE III: SYNTAX OF CONCEPT ATTAINMENT MODEL

| Phase | Learning process |
|---|---|
| 1. Presentation of information and conceptualization | (a) Introduction to the lesson<br>(b) Presentation of examples<br>(c) Students are asked to compare (the similarities and differences) of those examples |
| 2. Conceptual comprehension test | (a) Identify the concept by comparing with prior conceptual knowledge<br>(b) Students are asked about additional examples of that concept |
| 3. Analysis of thinking strategy | (a) Students explain a mathematical concept in their own words, through speaking and writing<br>(b) Students discuss the reasons used to draw conclusions about that concept |

Source: [56].

### D. Mathematical Conceptual Knowledge

Mathematical conceptual knowledge is the result of students' understanding of mathematical concepts [58]. Heritburg and Capenter [59] suggest that mathematical knowledge and understanding is a process that takes place within the brain of an individual. An individual will understand a mathematical concept only if it is part of the network schema of mathematical knowledge. Additionally, it is the understanding of meaning, mathematical structure, the ability to think logically and the ability to explain ideas to others [60]. Accordingly, mathematical understanding is the first priority in starting an activity or teaching the content of a lesson. Mathematical concepts are fundamental for teaching mathematics because students' success in learning mathematics depends on understanding the correct concepts of what they have learned [61]. Conceptual learning depends on cognitive development, learning environment and the learning model [62]. If students have the right concept, they will also be able to learn and solve mathematical problems reasonably. Students will gain a mathematical concept through teaching activities where they use their own logical reasoning [63].

Based on the works mentioned above, few researchers have integrated the concept attainment model with other models or with educational technology. In this study, we have attempted to close this gap by adding cloud services including cloud learning services, cloud learning devices and cloud learning environments, as components of the proposed model.

## III. METHOD

This study is divided into three phases:

**Phase 1:** The study of related documents.

1) Review documents, textbooks and relevant research on the principles of the concept attainment model. Taken from the Internet and from international journals, the findings can be used as a guideline for the design of learning activities.
2) Review documents, textbooks and relevant research on e-learning, mobile devices for learning contents, cloud technology and educational applications on cloud technologies.
3) Analyze systems, devices, mobile cloud learning tools, and their application in mathematical education. The results to be used as a guideline for implementation on mobile devices in learning environments.
4) Analyze the stage of organizing learning activities based on the concept attainment model in accordance with mobile cloud learning, as shown in Table IV.

**Phase 2:** Assessing the suitability of the developed model. Quantitative research methods are used by evaluating the suitability of the concept attainment model using cloud -based mobile learning. This involves five experts who have experience in designing mobile cloud learning and mathematics pedagogies based on cloud computing. The instrument used in this phase was a 5-level scale suitability assessment form. The data were analysed by mean ($\bar{x}$) and standard deviation (S.D.) and interpreted using the following criteria [64].

- 4.50–5.00 - most suitable
- 3.50-4.49 - very suitable
- 2.50-3.49 - suitable

- 1.50-2.49 - less suitable
- 1.00-1.49 - not suitable

TABLE IV: ORGANIZING OF CONCEPT ATTAINMENT MODEL USING CLOUD BASED MOBILE LEARNING

| Phase | Activities | The cloud technology used to support |
|---|---|---|
| 1. Presentation of information and conceptualization | - Instructors provide contents data, including examples or problems on cloud<br>- Explore, research, testing hypothesis | - Content creation tools (Google Doc)<br>- Storage tools (Dropbox) |
| 2. Conceptual comprehension test | - Identifying the definition of a concept - Students proceeded to implement planned solutions / solve the problems using cloud-supported tools<br>- Using questions between students and instructor | - Collaboration tools (Google Doc)<br>- Communication tools (Spreadsheets, Google Meet) |
| 3. Analysis of thinking strategy | Explain, discuss, determine mathematical concept and model as well, making conclusion | - Content creation tools (Google Slides)<br>- Presentation tools (Google meet, tools for recording sound)<br>- Cloud based tools for mathematics (online mathematical software and programming |

**Phase 3:** Study the results of using the proposed model.

### A. The Research Design and Procedure

The one group pre-test/post-test design is used to study the results with regard to this model. The experiment was conduct on Set Theory course. The subjects were 56 undergraduate students majoring in Mathematics, Faculty of Education, Sisaket Rajabhat University, who enrolled in this course. The research procedure includes the following steps:

1) The subjects were tested in terms of pretest of the conceptual knowledge.
2) Instruction with a concept attainment model using cloud based mobile learning.
3) At the end of the course, the subjects were tested in terms of posttest of the conceptual knowledge.

### B. Instrument

The research instruments in this phase were 1) the concept attainment model using cloud-based mobile learning, and 2) the mathematical conceptual knowledge test on Set Theory, consisting of three indicators [4]; relationships and connections with regard to mathematical concepts, mathematical principles, and mathematical methods reasoning.

### C. Data Analysis

The mathematical conceptual knowledge was analyzed from mathematical conceptual knowledge test scores before and after learning, by using mean ( $\bar{X}$ ), and standard deviation (S.D.) measures. The comparison of scores before and after learning was analyzed using a t-test for one sample group.

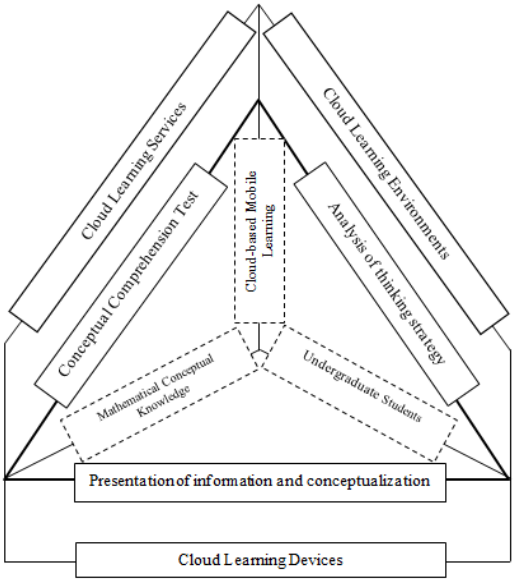


Fig. 1. The illustration of concept attainment model using cloud-based mobile learning for undergraduate students.

## IV. RESULTS

### A. Model Evaluation Results by Experts

The suitability assessment scores of the proposed model as evaluated by the experts were summarized as shown in Table V.

TABLE V: THE VIEWPOINT OF THE EXPERTS ON THE CONCEPT ATTAINMENT MODEL USING CLOUD-BASED MOBILE LEARNING

| | List of details | Results | | |
|---|---|---|---|---|
| | | $\bar{x}$ | S.D. | Interpretation |
| 1 | Components of concept attainment model with cloud-based mobile learning | 4.60 | 0.54 | Most Suitable |
| 2 | Accessibility | 4.80 | 0.44 | Most Suitable |
| 3 | Promote knowledge to students | 4.60 | 0.54 | Most Suitable |
| 4 | Supporting tools | 4.40 | 0.89 | Very Suitable |
| 5 | Implementation | 4.40 | 0.54 | Very Suitable |
| | Overall | 4.56 | 0.59 | Most Suitable |

From Table V, the overall assessment of the suitability of the concept attainment model using cloud-based mobile learning was at the level of "most suitable" ( $\bar{X}$ = 4.56, S.D. = 0.59). When considering for each item, it was found that accessibility was the most suitable at the highest mean score ( $\bar{X}$ = 4.80, S.D. = 0.44).

### B. The Study Results with Regard to Mathematical Conceptual Knowledge

The study of the undergraduate students' mathematical conceptual knowledge learned by the concept attainment model using cloud-based mobile learning, is given in Table VI.

TABLE VI: THE COMPARISON OF MATHEMATICAL CONCEPTUAL KNOWLEDGE SCORES FOR PRE-TEST AND POST-TEST

| Test | Score of mathematical conceptual knowledge | | | | | |
|---|---|---|---|---|---|---|
| | n | Full score | Mean | S.D. | t | p |
| Pre-test | 56 | 100 | 48.89 | 23.18 | 8.73 | 0.000* |
| Post-test | 56 | 100 | 60.94 | 23.98 | | |

*$p < 0.05$.

After the end of the study, pre-test and post-test scores are used to investigate improvements in mathematical conceptual knowledge by the concept attainment model using cloud-based mobile learning. As shown in Table VI, the mean score of the pre-test is 48.89. Meanwhile, the mean score of the post-test is 60.94. By comparing both tests, the value of t-test is 8.73 and $p< 0.05$. This indicates that the post-test scores were significantly higher than pre-test, on the level of 0.05. Consequently, it was found that students who studied with the concept attainment model using cloud-based mobile learning and had the mean score of mathematical conceptual knowledge in "Set Theory" on post-test were higher than those of pre-test on the level of 0.05 statistical significance.

## V. Discussion and Conclusion

The evaluation results of the suitability of the model by experts concluded that it was at the highest level. Each of the main stages is important for students to understand, conceptualize and, through collaborative learning, to create critical thinking leading to new conceptual knowledge. This follows [65], who suggests learning through mobile learning that allows learners to exchange experiences will create new knowledge. The results of the study imply that the cloud computing-based design of mobile cloud learning provides the tools and an academic environment for developing mathematical concepts in the mathematics learning process. All of the components contribute to enhancing conceptual knowledge.

Based on the findings, students have a higher score of conceptual knowledge in mathematics after studying than those before learning. This follows [66], who suggests that the concept attainment model is developed to support students' practice of learning the concepts. They need to manage existing information in order to learn new ideas more effectively. Following [13], it was found that undergraduate students using the concept attainment model have higher mathematical thinking abilities than those using conventional learning. This implies that it improves the understanding of lessons. The findings are consistent with [52] who find that score of achievement of geometric concepts of students who taught by concept attainment model is better than those taught by traditional method. Similarly, learning through mobile learning has effects on students' exchange of knowledge, experiences and the opinions of learners to create new knowledge [67]. Moreover, the employing of cloud technology as a teaching tool is consistent with [30], [36], [68] which focus on managing cloud computing's online learning environment, including the efficient collaboration and sharing of information among students.

It is important to understand how advanced technologies, such as cloud computing, extend our instructional and mathematics learning, especially encouraging the development of 21st century skills. The aim of this study is to assess the students' learning performance in the Set Theory course. The framework of cloud-based mobile learning incorporated with the concept attainment model is proposed. The application of such a model is used as a means of enhancing conceptual knowledge in mathematics. It was concluded that it had a significantly positive effect on undergraduate students' mathematical conceptual knowledge.

This study presents a concept attainment model in conjunction with mobile cloud learning. This proposed approach integrates mobile cloud learning with three main components - cloud learning services, cloud learning environments and cloud learning devices - to provide a concept attainment model. The model assessment results in terms of the most appropriate level and the experimental results, indicate that the students' performance is significantly enhanced by this approach.

The limitations with regard to this study relate to the students' lack of Internet readiness, including using cloud tools, during the learning process. This may affect the quality time spent on the lesson units, and also in terms of guidance feedback for the students. In addition, the study involved a one group design because the normal instructional schedule was provided for one class. If there are data compared with those studied by using another model, this may also act as another possible implementation to achieve the objectives of this study.

## Conflict of Interest

The authors declare no conflict of interest.

## Author Contributions

Anuchit Anupan conceived and designed the study, analysis tools, contributed data, visualization, reviewed and edited manuscript. Benjamas Chimmalee conceived and designed the analysis, conducted the research, collected the data, performed the analysis, wrote draft manuscript, validation. All authors have read and approved the final version of the manuscript.

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