

An Imagineering Learning Model using Advance Organizers with Internet of Things

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Abstract

An imagineering learning model using advance organizers with the internet of things was developed to promote creative innovation for learners in the 21st century. It is an innovation initiated by integrating classroom learning and technology that connects with the internet of things. The objectives of this research were (1) to study and synthesize the conceptual framework of the imagineering learning model using advance organizers with the internet of things, (2) to develop the imagineering learning model, and (3) to assess the appropriateness of the developed model. The participants comprised a purposive sample of five experts from various higher education institutions who have knowledge and ability in designing and developing learning models and teaching and learning systems. Research instruments included the (1) imagineering learning model and (2) assessments of the appropriateness of the proposed model. The results were in line with the expectations of the research team, which found that the proposed imagineering learning model can be used as an instrument to improve teaching and learning by integrating knowledge in computational science subjects with professional courses to develop creative innovations for elementary school learners. By applying imaginary teaching techniques and conceptual maps to cloud learning, the proposed imagineering learning model encourages learners to develop the knowledge and ability to innovate creatively. Knowledge from programming and knowledge of agricultural work in vocational courses must be integrated appropriately.

Keywords: imagineering learning model, advance organizers with internet of things, creative innovation

1. Introduction

Learning in the 21st century requires students to have the ability to understand and apply the skills in the subjects they have learned to practical life by using technology they are familiar with to create creativity and innovation. To meet the learning needs of the 21st century, learning must be improved to equip learners with the essential skills and knowledge to fit into the content of the eight issues. This includes providing a learning context for students to think critically, and to foster creativity and innovation. Therefore, organizing learning in the 21st century should adapt learning so that students can apply their knowledge and understanding of the subject matter in their lessons. This involves using modern technology to efficiently create innovations in the post-21st century, creating a high-caliber global population ready for the rapid changes in technology in the future.

The Core Curriculum of Basic Education B.E. 2551, Vocational Learning Subject Group (Revised B.E. 2561) focuses on developing students' knowledge and understanding so that they acquire the basic skills needed to live and consciously change. In addition, they need to be able to apply knowledge related to living and careers in order work creatively and compete in an international society. The content of the course focuses on life, family, and career. 5th-grade students should focus on systematic work, possess collaboration skills and creativity, understand basic problem-solving principles, and know and understand career and morality. As described earlier, students can use systematic thinking processes to create work or innovation to promote their careers (Ministry of Education, 2018).

Imagineering learning is a process that focuses on using imagination to think about a goal or outcome before entering the planning process and designing a strategy that will produce results consistent with what is thought to become a tangible invention or innovation (Office of the Education Council, 2014; Partnership for 21st century skills, 2008). Imagineering learning processes include: (1) Imagination, the ability to devise topics of interest using brain-storming and imagination in which all group members are interested; (2) Design, the ability to

research from documents or experts, including the implementation of planning and designing the task by sketching or drawing a storyboard; for example, to create the prototype model; (3) Developing, the ability to work step by step; (4) Presentation, the ability to empirically demonstrate the group's work to the public by presentation; and the ability to present the work carried out together; (5) Improvement, the ability to improve or adjust and summarize the work done together; and (6) Evaluation, the ability to evaluate the quality of the work, taking into consideration one's own output and the group's output, and whether the finished work is satisfactory. This enables learners to learn independently, and leads to innovative and creative works. In addition, it is applied to teaching and learning at all levels as a process aimed at enabling learners to learn by themselves, and to be creative and innovate (Chatwattana & Nilsook, 2017; Nilsook et al., 2021; Sreejun & Chatwattana, 2023). Therefore, imagineering learning is a new concept of learning management aimed at improving the characteristics of learners in the 21st century by enabling them to learn by themselves while equipping them with creative thinking skills and the ability to create innovations (Sreejun & Chatwattana, 2023).

Advance organizers transmit ideas into the design process through various tools by using images or information to connect with each other. The method for creating advance organizers is through organizing ideas, process summarizing, and reviewing. The use of advance organizers provides an overview of the content, relationship of data, and the extent of the problem that the designer has outlined as a model of work or innovation (Jariyapoom et al., 2017; Joyce & Weil, 1996). Organizing teaching and learning using advance organizers consists of four stages: conceptual preparation, structuring and modelling, linkage presentation, and a knowledge structuring summary (Jariyapoom et al., 2017).

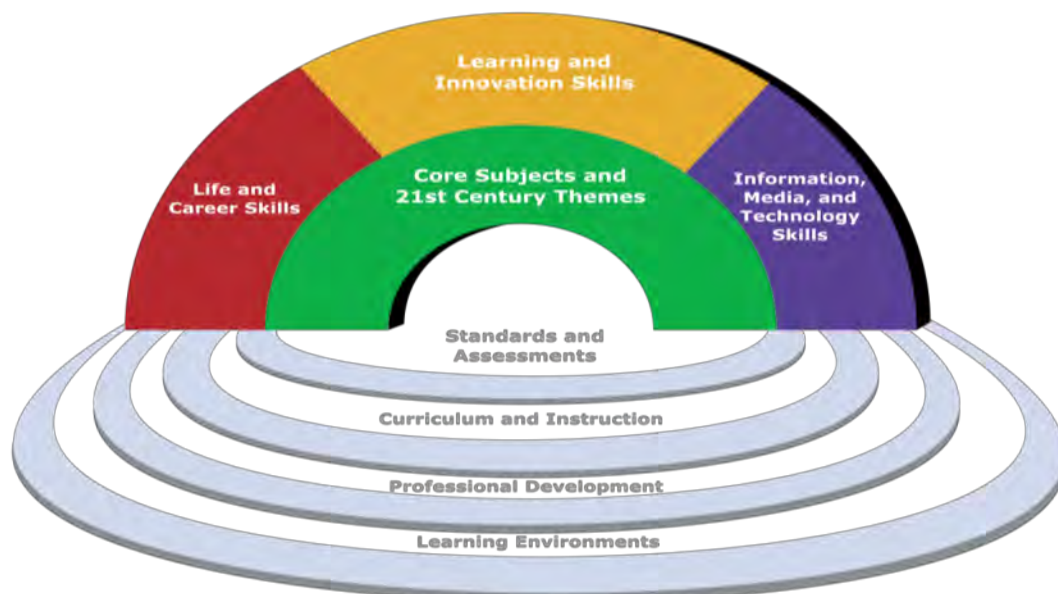


Figure 1. Framework for 21st century learning
(Partnership for 21st Century Skills, 2008)

Cloud technology is a service that takes the form of resource sharing. These resources are stored on large server machines connected to a network. Presently, this technology has been applied to various tasks, such as education, by creating a cloud ecosystem, which uses cloud computing technology in conjunction with various learning resources via the Internet. It encourages students to collaborate in learning through cloud technology (Gillet et al., 2017) so that they can then collaborate in working and learning through social media.

The internet of things (IoT) is a technology where all devices and tools are connected via a network. Using the IoT allows us to connect with the 3D world. In addition, it fits with a large number of real-life devices without restrictions. The IoT has spread across multiple industries and added value to the communication and electronics business by leveraging the advancement of the development of wired and wireless communication networks with greater accuracy and smaller equipment, resulting in lower production costs (Nittayathamkul et al., 2022).

Based on the above principles and concepts, the researchers developed an imagineering learning model using advance organizers with the IoT as a guideline for teaching and learning for students in the 21st century, focusing

on self-learning with creativity and innovation.

2. Research Objectives and Hypothesis

In this study, the researchers set the following objectives.

- To study and synthesize conceptual frameworks for an imagineering learning model using advance organizers with the IoT.
- To develop an imagineering learning model using advance organizers with the IoT.
- To study the appropriateness of developing such a model.

Assessment of the appropriateness of the imagineering learning model was that it was appropriate at a high level.

3. Research Methodology

Because this research focuses on developing an imagineering learning model using advance organizers with the IoT, the study falls under the category of research and development (R&D). A pre-experimental research method was adopted comprising a one-shot case study. The research methodology was as follows.

Research participants were five experts from various higher education institutions with the knowledge and ability to design and develop learning models and teaching and learning systems.

The researchers defined the research instruments and statistics used in the research as follows. The research instruments were (1) an imagineering learning model using advance organizers with the IoT and (2) an assessment form to evaluate the appropriateness of the Imagineering learning model. The latter involved the use of a five point Likert scale with highest, high, moderate, low, and lowest levels, respectively. The statistics generated in the data analysis were means and standard deviations.

Imagineering learning (Chatwattana & Nilsook, 2017; Nilsook et al., 2021; Sreejun & Chatwattana, 2023); the use of advance organizers in the teaching and learning model (Jariyapoom et al., 2017; Joyce & Weil, 1996; Khemmani, 2010); and use of the IoT to promote learning (Nittayathammakul et al., 2022) formed the basis for designing and developing the proposed imagineering learning model to encourage creative innovation. The process consisted of three phases:

Phase 1: Study, research, analyze. and synthesize documents and research relevant to developing an imagineering learning model using advance organizers with the IoT to use as a guideline for defining the conceptual framework of the study, including the instruction system (Khemmani, 2010; Utranan, 1982), imagineering learning (Chatwattana & Nilsook, 2017; Nilsook et al., 2021; Sreejun & Chatwattana, 2023); advance organizers (Jariyapoom et al., 2017; Joyce & Weil, 1996), the IoT (Nittayathammakul et al., 2022), cloud technology (Gillet et al., 2017), and creative innovation.

Phase 2: Develop an imagineering learning model using advance organizers with the IoT. In this stage, the researchers adopted a system approach as a guideline for design and development which consisted of four components: inputs, learning processes, output, and feedback.

Phase 3: Study the results of implementing the imagineering learning model using advance organizers with the IoT. In this stage, the purposive sample of five experts from various higher education institutions used the research instruments to assess the effectiveness of the developed model. The evaluation and interpretation criteria (Kanasutra, 1995) are presented in Table 1.

Table 1. Mean score range and interpretation of results

Range of average score	Interpretation of appropriateness
4.50 – 5.00	Highest
3.50 – 4.49	High
2.50 – 3.49	Moderate
1.50 – 2.49	Low
0.00 – 1.49	Lowest

4. Results

The results of developing an imagineering learning model using advance organizers with IoT. The results are summarized as follows:

4.1 The Synthesis of Conceptual Frameworks for Imagineering Learning Model using Advance Organizers with the IoT

The results of the analysis and synthesis of the process of imagineering learning consisted of six issues and 17 steps, as follows. (1) Imagine, i.e. the process of defining the imaginary problem of the work (Problem), the process of brainstorming imagination works (Brainstorm), Discussion, and a feasibility study of Imagine. (2) Design, including draft, storyboard writing, script writing, and prototyping. (3) Develop, the process of creating and testing. (4) Present, including show, contest, and make suggestions. (5) Improvement, including revision and conclusion. (6) Evaluation, imaginary process evaluation and product evaluation, respectively.

The results of the study and the synthesis of advance organizers used in various learning models are consistent in teaching learners to understand previous knowledge and then connect this with new knowledge through different forms of advance organizers. This allows the learner to develop ideas into collective thoughts and sustain them in their memory.

Regarding the results of the study and synthesis of the IoT in learning, the elements involved in applying the IoT in learning can be divided into the following: (1) learning processes, (2) use of the IoT as a learning tool; and (3) simulation of the classroom or learning situation.

Based on the theory relevant to the synthesis of a research conceptual framework, the imagineering learning model using advance organizers with the IoT is depicted in Figure 2.

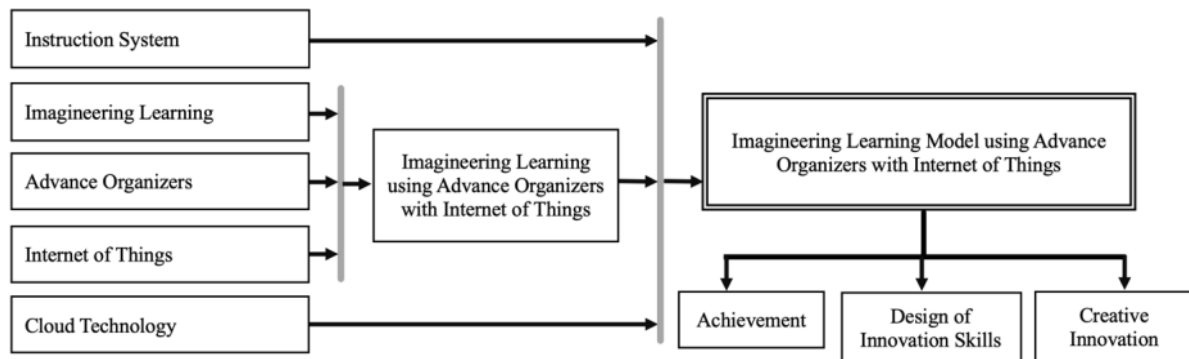


Figure 2. Conceptual research framework

4.2 The Development of the Imagineering Learning Model using Advance Organizers with the IoT.

The purpose in creating the imagineering learning model was to focus on equipping students with the skills to create new works and innovations, unique, which derives from critical thinking, problem-solving, and systematically modifying existing things to create novelties and solutions that benefit society. It forms an innovation that results from integrating classroom learning with the technology that connects intelligence to create creative innovations. The proposed development of the learning model are based on a systematic approach consisting of four components: inputs, learning process, output and feedback.

The imagineering learning model using advance organizers with the IoT consists of four main elements, as illustrated in Figure 3.

1. The input factor represents the elements involved in designing and developing the imagineering learning model, which comprise an analysis of the characteristics of learners, teachers, advance organizers, the IoT, cloud technology, and promoting learning tools.
2. The learning process: researchers synthesized the imagineering learning process with six stages of learning to create a learning process for the developed learning model, consisting of Imagine, Design, Develop, Present, Improvement, and Evaluate stages. At the same time, teachers provided tools to promote learning, namely, advance organizers combined with use of the IoT on cloud technologies as a tool for collaborative learning to build innovative design skills and learning achievement through small group activities.
3. Output denotes results from the learning process, achievement, creative innovation, and design of innovation skills, which are defined as the skills to innovate or develop new things differently by

applying technology to work and create value inventions for benefits.

- Feedback refers to the use of output data and feedback to improve the learning process and input factor, consisting of achievement scores, design of innovation skills, and creative innovation.

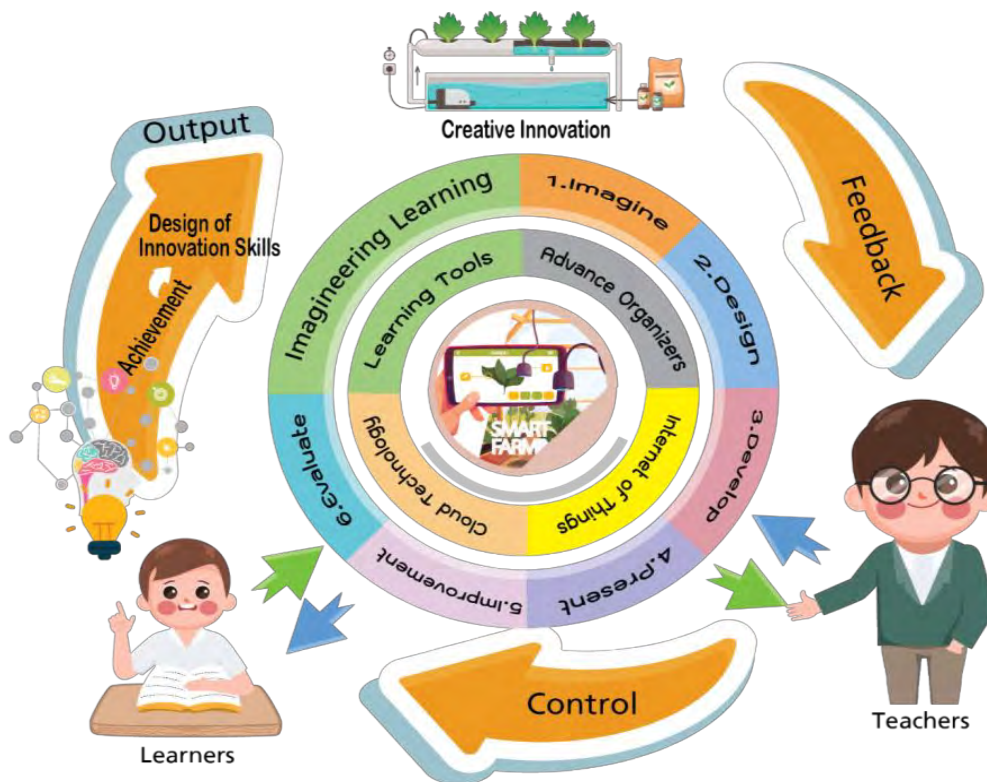


Figure 3. Imagineering learning model using advance organizers with the IoT

4.3 Results of the Assessment of the Appropriateness of the Proposed Imagineering Learning Model

The researchers surveyed the results obtained from the participants. The means and standard deviations resulting from the data analysis are summarized in Table 2 and 3.

Table 2. Assessment results regarding the appropriateness of the imagineering learning model using advance organizers with the IoT (integrated elements)

Assessment issues	Assessment results		Interpretation
	Mean	SD	
1. The imagineering learning model using advance organizers with the IoT is based on conceptual principles that are fundamental to developing the learning system.	4.00	0.00	High
2. The imagineering learning model using advance organizers with the IoT is comprehensive according to the main components of the learning system.	4.40	0.55	High
3. The imagineering learning model using advance organizers with the IoT is a unified and comprehensive theory for designing a conceptual research framework.	4.20	0.45	High
4. The order of elements in the design of the imagineering learning model using advance organizers with the IoT is evident and continuous.	4.00	0.00	High
5. Composing the sequence of elements of the imagineering learning model using advance organizers with the IoT is appropriate and easy to understand.	4.00	0.00	High
Overall average	4.12	0.33	High

Table 2 shows that the appropriateness of developing an imagineering learning model using advance organizers with the IoT (integrated elements) was rated as high (Mean = 4.12, SD. = 0.33). In conclusion, the proposed

imagineering learning model follows the conceptual principles that form the basis for developing the learning system. It has a comprehensive composition that can be used as a guideline for designing conceptual frameworks and developing learning systems that can encourage learners to develop innovative design skills and create creative innovations. These will be new inventions that differ from previous ones by applying the IoT and advance organizers to work and create value inventions for benefits, which aligns with the results of Chatwattana et al. (2023) who noted the development of the institute as a learning organization. This is achieved by providing people with the freedom to learn, create a varied body of knowledge, and sharing to enhance competencies, thereby providing them with the potential to contribute to the continuous progress of business operations towards goals. This involves combining new technologies to create new ideas and innovations to promote learning that can respond directly to the needs of modern learners. This is in line with a study by Nilsook et al. (2021) which concluded that project-based learning is a method of learning consistent with the development of vocational learners in Thailand, in that it aims to equip learners with the skills to create inventions and innovations through projects. It equips learners with the attributes to present, discuss and communicate with others.

Table 3. Results of the assessment of the appropriateness of the imagineering learning model using advance organizers with the internet of things

Assessment issues		Assessment results		Interpretation
		Mean	SD	
Input factors	1. Analyze learner characteristics	4.60	0.55	Highest
	2. Analyze teacher attributes	4.20	0.45	High
	3. Advance organizers	4.60	0.55	Highest
	4. The internet of things	5.00	0.00	Highest
	5. The cloud technology	4.40	0.55	High
	6. The promote learning tools	4.60	0.55	Highest
Learning process	1. Imagineering learning process	4.80	0.45	Highest
	2. Learning activities using an advance organizer	4.60	0.55	Highest
Output	1. Achievement	4.40	0.55	High
	2. Innovative design skills	4.60	0.55	Highest
	3. Creative innovation	4.40	0.55	High
Feedback	1. Achievement score	4.40	0.55	High
	2. Innovative design skills measurement results	4.40	0.55	High
	3. Creative innovation results	4.40	0.55	High
Overall average		4.53	0.50	Highest

The overall appropriateness of the imagineering learning model using advance organizers with the IoT was rated as being at the highest level (Mean = 4.53, SD. = 0.50).

Thus, the proposed imagineering learning model has a learning process, elements, and tools that can be used as a guideline for designing and developing a learning system that encourages students to create innovative design skills by applying the six stages of the imagineering learning process. In addition, the use of advance organizers with the IoT serve as tools for promoting learning. The findings are consistent with those of Jariyapoom et al. (2017), which stated that applying advance organizers in learning assists learners in developing systematic thinking for problem-solving. It is also consistent with Chatwattana & Nilsook (2017) who found that using the project-based learning process as a base for integrating imagineering learning can encourage learners to achieve learning outcomes, develop creative construction skills, and foster collaborative skills.

5. Conclusion

Learning in the form of the imagineering learning model using advance organizers with the IoT can integrate previous and new knowledge to create knowledge that can extend critical thinking to create innovation in each subject and linking this using the advance organizers tool through contemporary technology. The learning process is relevant to learning in the 21st century, as it allows learners to understand and apply various skills in different subjects and integrate them.

The proposed imagineering learning model to promote creative innovation consists of four main components. (1) Inputs, including teachers who are responsible for analyzing learners, analysing the curriculum to optimize the learning process, and teaching materials for using the advance organizers. (2) The learning process: the study synthesized the imagineering learning process with six learning stages: Imagine, Design, Develop, Present, Improvement, and Evaluate, to create the proposed learning model. The teachers provide learning materials

using advance organizers with the IoT to link the learner's previous knowledge with new knowledge and develop the work into an innovation. (3) Output refers to achievement, innovative design skills using the advance organizers and the IoT, and creative innovation. (4) Feedback consists of achievement, design of innovation skills, and creative innovation.

The results of the assessment of the appropriateness of the proposed imagineering learning model were as follows. (1) the appropriateness of developing the proposed imagineering learning model using advance organizers was rated as high (Mean = 4.12, SD. = 0.33), and (2) the appropriateness of the proposed imagineering learning model overall was rated as highest (Mean = 4.53, SD. = 0.50).

References

- Chatwattana, P., Wangsorn, S., & Promchai, P. (2023). The Mobile Application via Experiential Learning for Public Relations in Thailand. *International Journal of Information and Education Technology*, 13(2), 296-301.
- Chatwattana, P., & Nilsook, P. (2017). A Web-based Learning System using Project-based Learning and Imagineering. *International Journal of Emerging Technologies in Learning*, 12(5), 4-22. <https://doi.org/10.3991/ijet.v12i05.6344>
- Gillet, D., Rodriguez-Triana, M. J., Jong, T. D., Bollen, L., & Dikke, D. (2017). *Cloud ecosystem for supporting inquiry learning with online labs: creation, personalization, and exploitation*. Proc. 2017 4th Experiment@International Conference. University of Algarve, Faro, Portugal: IEEE. pp. 208-213.
- Jariyapoom, T., Wannapiroon, P., & Piriyaawong, P. (2017). Business Advance Organizer via Social Cloud to Enhance System Thinking. *Journal of MCU Peace Studies*, 5(3), 250-264.
- Joyce, B., & Weil, M. (1996). *Models of teaching (5th ed.)*. London: Allyn and Bacon.
- Kanasutra, P. (1995). *Statistics for Research in the Behavioral Sciences*. Bangkok: Chulalongkorn University Press.
- Khemmani, T., (2010). *Science of Teaching: Knowledge of Efficient Learning Process Management*. Bangkok: Chulalongkorn University Press.
- Ministry of Education. (2018). *The Basic Education Core Curriculum B.E. 2551 and Learning Standards and Indicators (revised edition B.E. 2560)*. Bangkok: Ministry of Education.
- Nilsook, P., Chatwattana, P., & Seechaliao, T. (2021). The Project-based Learning Management Process for Vocational and Technical Education. *Higher Education Studies*, 11(2), 20-29. <https://doi.org/10.5539/hes.v11n2p20>
- Nittayathamkul, V., Chatwattana, P., & Piriyaawong, P. (2022). Crowd Context-Based Learning Process via IoT Wearable Technology to Promote Digital Health Literacy. *International Education Studies*, 15(6), 27-38. <https://doi.org/10.5539/ies.v15n6p27>
- Office of the Education Council. (2014). *Project-based learning management*. Bangkok: Ministry of Education, Thailand.
- Partnership for 21st Century Skills. (2008). *21st Century Skills, Education & Competitiveness*. Partnership for 21st Century Skills. Retrieved from <https://files.eric.ed.gov/fulltext/ED519337.pdf>
- Sreejun, S., & Chatwattana, P. (2023). The Imagineering Learning Model with Inquiry-Based Learning via Augmented Reality to Enhance Creative Products and Digital Empathy. *Journal of Education and Learning*, 12(2), 52-59. <https://doi.org/10.5539/jel.v12n2p52>
- Utranan, S. (1982). *Systematic Instructional Management*. Bangkok: Chulalongkorn University.

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