The Application of LADS (Learning Activities of Data Structure Course) Model through the Computer Network System Environment

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Abstract

In this paper, we present the application of the Learning Activities of Data Structure Course (LADS) model through the computer network system environment, to examine the learning achievement of students who studied with the developed learning activities, and to analyze the satisfaction of students with the developed learning activities. The research methodology was designed based on the principles of ADDID model as follows: 1) an instructional problem analysis (A), 2) the design (D) of learning units, activities and materials evaluated by the experts, 3) the development (D) of learning units, activities and materials evaluated by the experts, 4) the implementation (I) of the developed learning activities, and 5) documentations on the conclusion and discussion (D). The research instruments were a questionnaire, an achievement test and the learning activities of the LADS model through the computer network environment. The research statistics used were mean, standard deviation, t-test, and the Event1/Event2 (E1/E2) formula for calculating course efficiency. The sample were twenty undergraduate students in the computer education program at Rajabhat Maha Sarakham University. The LADS model through the computer network system environment had been designed and developed through a research process. The developed learning model consisted of seven stages: the previewing of the lesson, the pretest, the self-study, further study, the discussion and conclusion of the learning outcomes, the posttest, and the conclusion of learning activities. The results revealed that the average agreement of the experts regarding the developed learning model was at the high level (Mean = 4.42, and SD. = 0.61). The efficiency value of the learning activities was 80.20/80.05 that higher that the determined value at 80/80. The average pretest score of the students regarding the achievement was at the .05 level. The average level of the students' satisfaction with the learning activities was high (Mean = 4.23, S.D. = 0.54). The results indicate that the activities of the LADS model through the computer network system environment course are suitable and useful for an instructional purpose.

Keyword: LADS model, ADDID model, Event1/Event2 (E1/E2) formula, Delphi technique

1. Introduction

1.1 Background information and paper aims

The main purpose of education is to effectively provide a nation with a qualified workforce, but also to bring the new technologies, generations of the cultural heritage, language and to strengthen national identity. Increasing global competition intensifies the tension between the dual aims of education. This makes teacher education reforms ideologically and politically more important than before (Hargreaves, 1994). Education reform, it is the name given to a political process with the goal of improving public education in the country. Small improvements in education theoretically have large social returns, in health, wealth, and well-being. In general, education reforms have taken different forms because the motivations of reformers have differed. A stated motivation has been to reduce cost to students and society. From ancient times until now, one goal was to reduce the expense of a classical education. Ideally, classical education is undertaken with a highly educated full-time personal tutor. This was available only to the most wealthy. The examples of innovations intended to lower the cost of a classical education are e-learning, encyclopedias, and public libraries, etc.

Education reform has been pursued for a variety of specific reasons, basically, most reforms aim at redressing some societal ills, such as poverty, gender, or class-based inequities, or perceived ineffectiveness (Murphy & Beck, 1995). Reforms are usually proposed by thinkers who aim to redress societal ills or institute societal changes, most often through a change in the education of the members of a class of people, the preparation of a ruling class to rule or a working class to work, the social hygiene of a lower or immigrant class, the preparation of citizens in a democracy or republic, etc. The idea that all children should be provided with a high level of education is a relatively recent idea.

In a study of Stanford University, it is universally agreed by educators and experts that a key component of improving student achievement is raising standards. Therefore, the advantages of education reform of the National Education Summit, state governors, education leaders, and business leaders came to a consensus that use of standards will as follows: 1) help all students learn more by demanding higher student proficiency and providing effective methods to help students achieve high standards, 2) provide parents, schools, and communities with an unprecedented opportunity to debate and reach agreement on what students should know and be able to do, 3) focus the education system on understandable, objective, measurable, and well-defined goals to enable schools to work smarter and more productively, 4) reinforce the best teaching and educational practices already found in classrooms and make them the norm, 5) provide real accountability by focusing squarely on results and helping the public and local and state educators evaluate which programs work best (Stanford University, 2000). However, it is generally agreed that in order to be successful, these higher standards must be aligned with reforms in testing, teacher education, improved teaching practices, and proper allocation of resources.

Thus, learning reform is the heart of the education reform, and it conforms to the 1999 National Education Act as well. It has become the mission that teachers, lecturers and educators must carry on to achieve the goals as indicated in the Act. The teachers, lecturers and educators responsible in teaching and learning need to re-examine their teaching and learning process in order to determine to what extent their teaching and learning is qualified, accurate and appropriate considering current Thai and international social conditions (UNESCO Bangkok, 2004), and how media and technology have to be applied as learning instruments (ACCU-APPEAL, 2003).

Thailand has undergone an education reform since 1995. After the 1997 economic crisis, the reform process has been stepped up as compelled by both internal and external factors (Fry, 2005). Education reform is imperative for sustainable development of the country because in a knowledge-based economy, competitiveness is attained through knowledge and ability of the people to innovate with the appropriate use of ICT in an optimum business environment (ONEC, 2004).

Pisutta Arreeraad introduced the LADS model responding to the learning styles in the education reform of the 1999 National Education Act. In general, the model included the learning activity styles in the course of data structure, Computer Science Program, Bachelor's of Science, Rajabhat Maha Sarakham University (Arreeraad, 2009). The researcher of the LADS model suggested that future development of the learning activities should be performed through the computer network system environment for more convenience. In addition, the researcher who surveyed the student group participating in the use of LADS model in the Data Structure course found that the students agreed in the same way that the media used did not respond to time and space. For this reason, the LADS model was then applied through the computer network system environment in the Data Structure course in this study.

The aims of this study were to apply the LADS model through the computer network system environment, to compare the students' achievement before and after the LADS model course, and to find the students' satisfaction upon the learning activities of the LADS model through the computer network system environment.

1.2 The ADDID model

Monchai Tiantong and Pisutta Arreeraad conducted the research entitled "A development of the learning reform process through the computer network system" or "The ADDID Model". The model introduced the relationship of the process or the stages and the development of the learning activities focusing mainly on the learners. The computer technology was also used as the instrument in producing the following learning materials and media: project presentation on the computer, computer-assisted instruction (CAI) lessons, and web-based instruction (WBI) lessons. These learning materials consisted of pictures, sound, animation and video clips with the interactive system available for users. There were 5 stages of the ADDID model: analysis, design, development, implementation, and documentation. The research found that the experts considered the model to be definitely appropriate (Tiantong, 2007).

1.3 The LADS model

Pisuta Arreeraad studied the learning model of the data structure course using the Delphi technique that collected the data from twenty five experts in Thai universities. The research summarized that the learning activities of data structure or the LADS model in the Data Structure course of the computer science program for undergraduate students at Rajabhat Maha Sarakham University included nine steps of learning activities as follows: 1) previewing activities, 2) pretesting, 3) giving interactive lectures, 4) self-studying, 5) doing additional research, 6) writing program workshop, 7) discussing and summarizing the study, 8) posttesting, and 9) concluding the learning activities (Arreeraad, 2009).
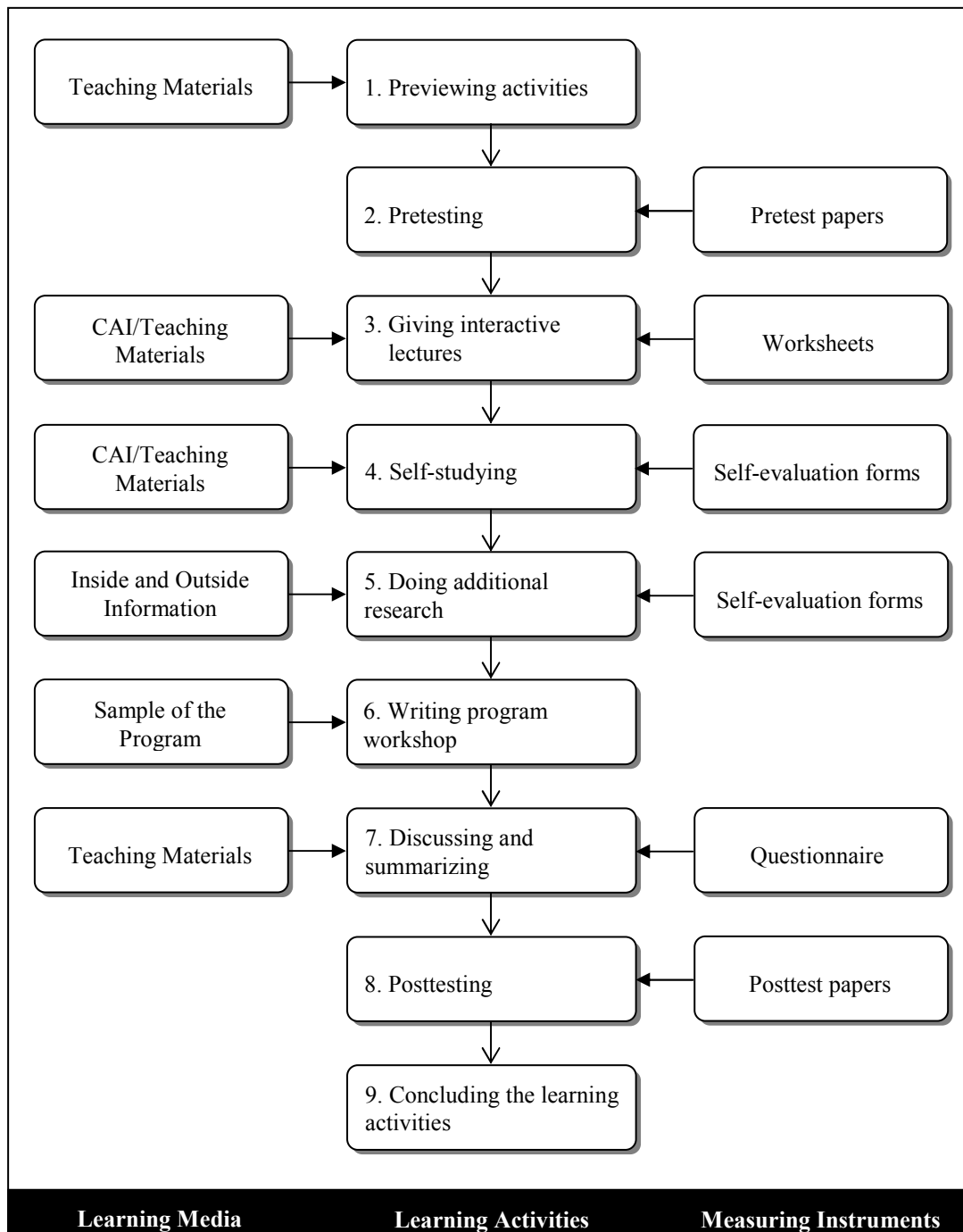

Figure 1. The learning activities of the LADS model

2. Methodology

2.1 Research procedure

This research intended to study only the data structure course of the computer education program at Rajabhat Maha Sarakham University. The research was conducted based on the model of the learning reform process through the computer network system (or the ADDID model) as in Figure 2. The model consisted of the five stages as follows: 1) A – Analysis: the first stage was to study the related literature, research, and analyze general conditions of the teaching and learning problems, 2) D – Design: this stage was the design stage of the learning activity model and instruments. The model and instruments were also examined by the experts in curriculum and teaching (or in computer instruction), and the experts in data structure, 3) D – Development: this stage was to develop the activity model, synthesize the process, do activities, produce instruments, and get them examined by the experts. After that, try the instruments in small sample groups, 4) I – Implementation: this stage was to implement the instruments with the sample group of students in the research project. The researcher set the plan and activities with the learners, did the pretest, organized teaching and learning activities, and administered the posttest, and 5) D – Documentation: the last stage was the paperwork process. It consisted of improving the learning activity manuals, classifying learning activity tools into separate groups, writing the results of the study and posting them on the websites or publishing them on the printed media.
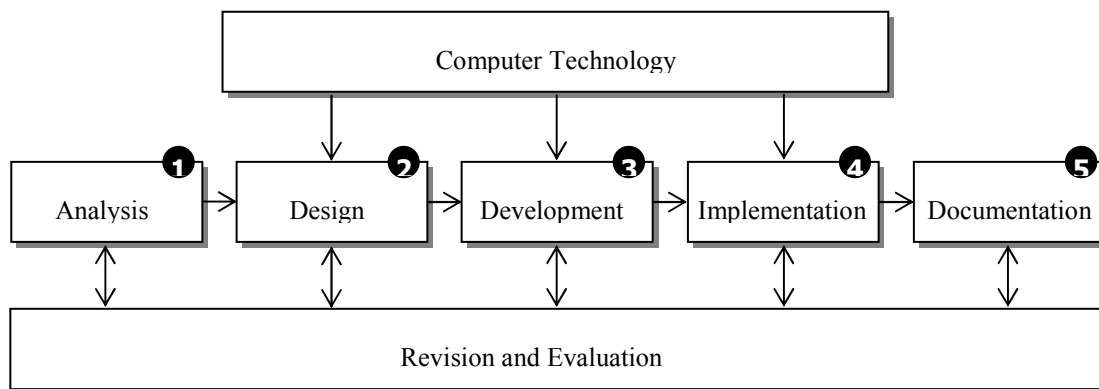

Figure 2. The learning reform process through the computer network system (the ADDID model)

2.2 Population and sample group

The sample group comprised twenty undergraduate students, major in computer education at the Rajabhat Maha Sarakham University, and five experts, who are in computer education in Thai university for evaluate the LADS model through the computer network system environment.

2.3 Research tools

The research tools were pretest, posttest, and quizzes on the LADS model through the computer network system environment, these for evaluate the learning achievement and the efficiency value, and a rating scale questionnaire for finding the satisfaction upon the learning activities of the LADS model through the computer network system environment.

2.4 Data analysis

The following statistics were applied in this study:

2.4.1 The E1/E2 formula (Bramawong, 1992) were used to calculate the efficiency value of the LADS model through the computer network system environment.

2.4.2 The t-test was used to find the mean scores of the students in the pretest and posttest.

2.4.3 The mean and standard deviation were used to represent the evaluation value of the learning activity model as examined by the experts in the field.

3. Results

3.1 The applications of the LADS model

The applications of the LADS model through the computer network system environment were functional and appropriate as shown in Figure 3.
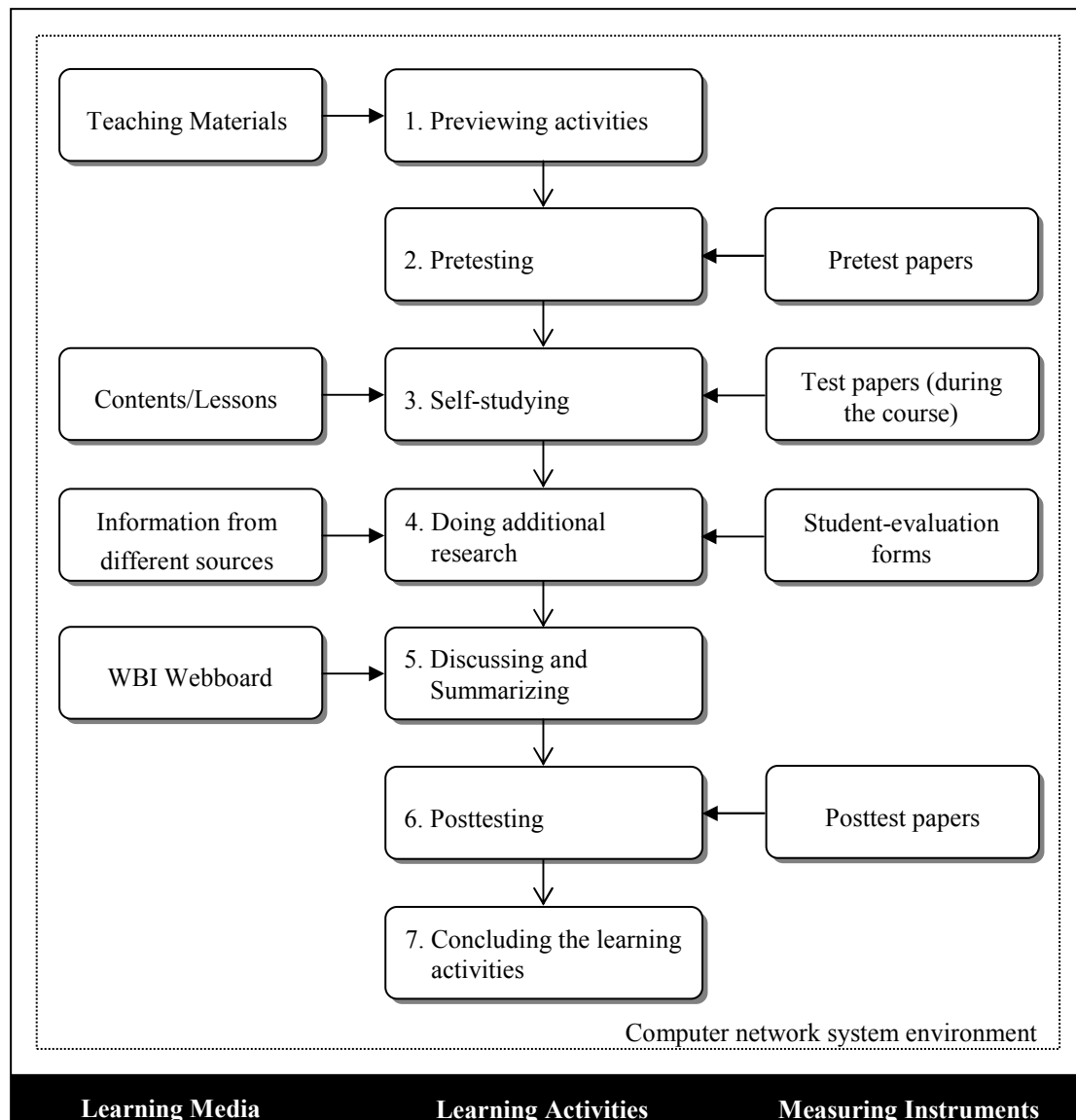

Figure 3. The learning activities of the LADS model through the computer network system environment

In Figure 3, the LADS model through the computer network system environment consisted of the seven stages of learning activities as follows: 1) previewing activities, 2) pretesting, 3) self-studying, 4) doing additional research, 5) discussing the findings and summarizing the study, 6) posttesting, and 7) concluding the learning activities.

3.2 The analysis results of the LADS model

The analysis results of the LADS model through the computer network system environment from five experts who are in computer education in Thai university, represented by the Mean and S.D. are shown in Table 1.

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Table 1. The evaluation results of the LADS model activities from the experts

The appropriateness of activities	Level of Agreement		Interpretation
	Mean	**S.D.**	
1. The appropriateness of the overall learning activities	4.34	0.64	Mostly agreed
2. The learning activities can be used in the real world	4.40	0.54	Mostly agreed
3. The learning activities are modern	4.60	0.54	Mostly agreed
4. The learning activities support the use of technology	4.60	0.54	Mostly agreed
5. The learning activities are student-centered	4.40	0.54	Mostly agreed
6. The learning activities are integrative	4.20	0.83	Mostly agreed
Overall mean	4.42	0.61	Mostly agreed

In Table 1, the analysis results show the high agreement level of the experts (Mean = 4.42, S.D. = 0.61) on the appropriateness of activities.

3.3 The efficiency value of the learning activities

The efficiency value of the learning activities was calculated from the test scores of the students during the course and those in the posttest. The scores obtained were analyzed and compared using the formula of E1/E2 (Bramawong, 1992) at the efficiency level of 80/80 and shown in percentage in Table 2, in order to truly benefit the students.

Table 2. The analysis of the efficiency value of the learning activities using the formula of E1/E2

No. of students	Average scores during the course (quizzes) (20)	Average scores in the posttest (20)	E1 (%)	E2 (%)
20	16.04	16.01	(16.04/20)*100 = 80.20	(16.01/20)*100 = 80.05

In Table 2, the efficiency value of the learning activities on the E1/E2 formula was found to meet the determined value of 80/80. It can be concluded that the learning activities was efficient at the value of 80.20 and 80.05, which was slightly above the determined value.

3.4 The learning achievement of students

The learning achievement of undergrad students who attended the course was analyzed and compared using the t-test, as shown in Table 3.

Table 3. The analysis of the learning achievement before and after the course using the t-test

Score	N	Mean	df	t
Pretest scores	20	20.70	19	6.22*
Posttest scores	20	60.05	19	

In Table 3, the average scores of students in the pretest is 20.70 and those in the posttest are 60.05. After the t-test analysis, the t value is 6.22, which is much higher than the set value of 1.729. Therefore, the pretest scores are found to be significantly different from the posttest ones at the .05 level.

3.5 The students' satisfaction of the learning activities

The students' satisfaction of the learning activities was analyzed and calculated to find the Mean and S.D. of the satisfaction, as shown in Table 4.

Table 4. The students' satisfaction of the learning activities

Aspects	Level of Satisfaction		Interpretation
	Mean	**S.D.**	
1. The media appropriateness	4.14	0.50	Mostly agreed
2. Individual learning activity	4.11	0.58	Mostly agreed
3. Student participation in the learning activities	4.02	0.50	Mostly agreed
4. Evaluating and measuring instruments	4.15	0.49	Mostly agreed
5. Response to individual differences	4.23	0.58	Mostly agreed
Overall mean	4.23	0.54	Mostly agreed

In Table 4, the students appear to express the high level of satisfaction to the learning activities in every aspect and the average mean is 4.23 and the S.D. is 0.54.

4. Conclusion

The computer network are the backbone of knowledge society. The networks have affected various pedagogical developments in education (Szeto, 2007), thus this study aims to apply the Learning Activities of Data Structure Course (LADS) model through the computer network system environment, to compare the students' achievement before and after the LADS model course, and to find the students' satisfaction upon the learning activities of the LADS model through the computer network system environment. It led to the model process that can be used as the guidelines in developing the learning activities and the student-centered classroom. The research had been conducted traditionally and systematically and examined by the experts. It also followed the learning management principles, as stated in the 1999 National Education Act. The LADS model consisted of the seven stages of learning activities: 1) previewing activities, 2) pretesting, 3) self-studying, 4) doing additional research, 5) discussing the findings and summarizing the study, 6) posttesting, and 7) concluding the learning activities. The previewing activities allowed the students to recognize the topic, contents and objectives and prepared them for the lessons. The pretest let the students know their learning ability. The self-study built up the learning skills of the students. In this stage, they studied from the materials prepared by the teacher at their own pace and could spend longer time on studying if they wanted to. Moreover, the teacher gave them some worksheets for additional practice. In the discussion and conclusion stage, the students joined the group to post their comments and discussion on the web board to practice thinking logically and systematically. The posttest was to evaluate the students' knowledge and achievement after the course. The teacher and students summarized the learning activities together and posted the final conclusion on the webboard.

In sum, the learning activities of the Learning Activities of Data Structure Course (LADS) model through the computer network system environment were efficient and could be applied to organize the effective teaching and learning.

Though many teachers and educators have adopted progressive, innovative teaching approaches emphasizing active learning, still many students learn by traditional methods emphasizing memory and passive learning that is teacher-centered (Fry, 2005), this study reveals that the learning through the computer network system environment are many advantages when compared to traditional classroom learning, such learning allows a more student-centered teaching approach. Because every student has his or her way of learning that works for them,

getting an online education may help in ensuring that each lesson or material is completely understood before moving on to the next, which in turn, could result to better learning (Online Education, 2009). Therefore, it should promote the development of the learning through computer network system environment that truly benefits the student in this era of technology and innovations.

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