

## The impact of using blended learning method on tenth grade achievement in math in Southern al-Mazar directorate of education

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### Abstract

The study aimed to identify The impact of using blended learning method on tenth grade achievement in math in Southern al-Mazar directorate of education .The study sample consisted of (65) male and (74) female students purposively selected from of tenth grade students in schools in al-karakgovernorate for the 2019/2020 academic year, they were divided into four sections in two schools, one for boys and the other for girls, the sections were chosen by means of blended learning and traditional learning. The study tool consisted of an educational material and an achievement test to measure student achievement, and the validity and reliability of the study tool was verified. The results of the study showed that there was a statistically significant difference in the achievement of the study sample at the level of significance ( $\alpha \leq 0.05$ ) in favour of the group taught through blended learning method, and the results also showed that there was no statistically significant difference in achievement at the level of significance ( $\alpha \leq 0.05$ ) due to gender or interaction between them, and in light of the results of the study, the researcher recommended a set of recommendations for those concerned and specialized.

**Keywords:** blended learning, achievement, math.

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### I. Introduction

A math teacher is expected to master effective educational qualifications to determine a suitable method for educational situation. Therefore , the implementation of new teaching methods which provides learners with variety of experience enabling them to conclude facts and scientific generalizations and contribute to acquire skills that had rapid effect on activities and new educational situations ( Safasfeh 2016).

Considering the global scientific development in the educational field, one witnesses the world's trend and its acceleration towards scientific and technological progress in various walks of life. Here we see the world keeping pace with the rapid global changes and developments and the support that educational scientific research receives to serve this goal because we are badly in need to involve these developments and technologies in our educational life. It became necessary for us to emulate the world in terms of technology, education, development, and keeping up with modernity in everything, especially methods of learning and teaching (Mohamed,2012) .

As the world is experiencing a major scientific and technological revolution, which had an impact on all aspects of life, the educational institution has been required to search for new educational methods and models; To face many challenges at the global level, and among these challenges is the increase in the demand for learning along with the decrease in the number of educational institutions, and the increase in the amount of information in all branches of knowledge, so e-learning appeared to help the learner to learn in the place he wants and at the time he prefers (Daams, 2010).

Hence the interest of educators in scientific education, especially in teaching Math, that learning is not merely the transfer of scientific knowledge from the teacher to the learner, but rather a process that means the mental, emotional and skillful development of the student, so that his personality is integrated in various aspects. There is no choice but to focus on how the learner transfer knowledge rather than how he memorize without comprehension (Zaitoon, 2004).

E-learning, in turn, focuses on introducing technology into the learning process and transforming traditional classrooms into virtual classes, by using local or international networks. However, the technological development that the world witnessed, regardless of development, does not substitute for the usual methods of learning and learning, hence the concept of blended learning appeared as a natural development of e-learning, this type does not put an end to e-learning or traditional learning, but rather it is a combination of both (Al-Ghamdi, 2007).

Blended learning is an integrated system that integrates the traditional face-to-face teaching method with e-learning. It directs and assists the learner during each stage of learning, so it shows the essential and

effective role of the teacher in the use of e-learning. Reliance on e-learning alone is insufficient due to its need for someone guide students how to use it, and this is the task of blended learning; it highlights the teacher's role in education process being the cornerstone of traditional methods of learning (Alfigi, 2011).

The use of these computerized curricula is based on the use of blended learning, and the idea of conducting this study came to know the effect of blended learning in teaching Math through the computerized curricula on the (Eduwave), compared to the traditional method in the achievement of tenthgrade students in Alkarak governorate

### **1.1 Problem statement and questions .**

It is noted that Math is one of the subjects that are strongly related to scientific and everyday life. In addition, it concerns all researchers. Therefore, it is necessary to create new methods in teaching, the results of the National Test for Math and Mathematics for the year (2007) showed that Jordan ranked (20) out of (49) countries that participated in the study. And despite the superiority of Jordan over the participating Arab countries, and despite the clear improvement in. The level of our students in Math compared to their level in 2003, there is need to introduce more educational innovations that would raise the standards of our students in Math (Abu Libda, 2008).

### **1.2 This study came to answer the following questions.**

1. Is there a statistically significant difference at the level of significance ( $\alpha \leq 0.05$ ) in the achievement of the grade students in math ascribed to the teaching method (blended - traditional).
2. Is there a statistically significant difference at the level of significance ( $\alpha \leq 0.05$ ) in math achievement among Tenthgrade students due to gender?
3. Is there a statistically significant difference at the level of significance ( $\alpha \leq 0.05$ ) attributed to the interaction between teaching method and gender?

### **1.3 Study hypotheses.**

1. There is no statistically significant difference at the level of significance ( $\alpha \leq 0.05$ ) in math achievement of the Tenthgrade students due to the teaching method (blended – traditional)?
2. There is no statistically significant difference at the level of significance ( $\alpha \leq 0.05$ ) in math achievement of the Tenthgrade students due to the gender?
3. There is no statistically significant difference at the level of significance ( $\alpha \leq 0.05$ ) in math achievement of the Tenthgrade students due to the interaction between the teaching method and gender?

### **1.4 The significance of the study.**

1. The use of blended learning in our educational classes and its effect on students achievement in scientific subjects, especially basic stage school students, who are fond of learning through images and shapes more than memorization and indoctrination.
2. Giving students' opportunity to assume a greater role in different classroom situations due to blended learning ability to make the learner active and effective while acquiring facts, skills and processes. Therefore, there is need to know the effect of using blended learning on the achievement of students in tenthgrade.

### **1.5 Purpose of the study.**

The study aims to reveal the effect of using a teaching method based on blended teaching on the achievement of tenthgrade students in Math compared to teaching with the traditional method and the effect of gender in that.

### **The limits of the study:**

#### **1.6**

1. This study was confined to the tenthgrade students in the schools of the Al-mazar Directorate in Al-karak Governorate for the second semester of the 2019/2020 academic year.
2. This study was limited to one academic unit from the tenth grade math textbook, entitled (The statistics and probabilities).

## **II. The theoretical framework and previous studies.**

### **First: The theoretical framework.**

The advancement in the fields of math was and is still in continuous development, and this rapid progress in the fields of Math, in turn, led to the emergence of transformative movements in the fields of scientific education, and these movements advanced these Math until they became one of the most important Math in the world, in which there resides renewal, development and the ability to change. These movements were accompanied by various modern educational methods and strategies that have played an effective role in following up the course of changes and developments in this field.

The blended technologies in learning continued until the term blended learning appeared as a result of the e-learning trend, which appeared in the early nineties and focused on replacing traditional classrooms with

virtual classes, putting an end to the traditional teacher's role and introducing modern technology in teaching. After that, research and scientific experiments began to show us the shortcomings of E-learning -no matter how highly developed E-learning is , it will not be a substitute for traditional learning, which is the backbone of the process of blended learning and traditional learning, and because it is a combination of both, we do not cancel technological development, but rather use it functionally in our regular classes (Salama, 2005).

### **2.1 Advantages of blended learning.**

Warrier (2006) believes that blended learning can be in line with students' needs, so that the student acquires knowledge as much as he possesses the skills and the information he needs. Salama (2005) states that blended learning has many advantages, including.

1. Not depriving the learner of the pleasure of face to face interaction with his colleagues and teachers.
2. Strengthening the human aspects and social relations between the learners and between the teachers as well.
3. Flexibility to meet all individual needs and learning styles of learners of all levels, ages and times.
4. Benefiting from technological advances in design, implementation and use.
5. Enriching human knowledge and raising the quality of the educational process, then the quality of the educational product and the efficiency of teachers.
6. Cultural communication between different cultures to benefit from everything new in Math.
7. Many scientific topics are difficult to teach completely through e learning, such as high skills, so blended learning represents one of the proposed solutions to solve such problems.

### **How to design blended learning lessons.**

There is a set of steps to be followed during preparing and designing lessons based on blended learning, referred to by Dziuban, Hartman & Moskal, 2004:

**First:** Determining the type of blended learning program that must be done, is it transformative or creative: will the designer convert the already existing program from a traditional program to a blended program and wants to improve it by adding some e-learning methods? Or does he want to create a program from the start based on blended learning?

**Second:** Determining the mixing methods, types and how to use it: This depends on the answer to the following questions:

1. What is the best educational way to implement good content instruction?
2. What is the best way to direct student education?
3. What is the best way to meet the institutional requirements and conditions regarding blended learning?

Accordingly, the designer of lessons based on blended learning must implement blended learning through four stages: (Dziuban, Hartman & Moskal, 2004).

### **The first stage: content analysis: This stage includes:**

1. Defining general goals and learning objectives: It is the compass that guides the teacher throughout the lesson.
2. The period of time, so that a schedule is defined, and since there are activities that depend on the Internet and activities that depend on face-to-face learning, there must be a balance between them within specific and reasonable timing .Attention must be paid not to excessively use any kind of them. Sufficient time should be provided to complete the activities and paying attention that class time must be covered by class activities and that there is no additional free time, so the designer must create additional activities and give the teacher freedom to give or leave them.
3. Determining the previous requirements: they are required by both the teacher and the student, but the focus must be on academic skills related to the subject matter of the lessons rather than technical skills.
4. Determine the multiple skills available in this content, such as: cognitive/procedural, mental, personal, motor, and affective.

### **The second stage: analysis of students' needs.**

The lesson designer must know what the students need, i.e. the extent to which students need this program, either to eliminate a problem they have or to raise their level in a certain aspect or change an existing situation to a desirable one

### **The third stage: This stage includes determining the method of implementing each of the content parts.**

This is generally done in three ways

1. Disconnected, "offline" (face to face), such as: (lectures, role-playing).
2. Offline "offline" (individual work), such as: (books, shops, radio).
3. Connected to the Internet and online interaction media, such as: (interactive contents, electronic teaching, and virtual classes).

**The fourth stage:** regulating requirements and constraints to organize work in general.

It includes creating files to include an organized group of data and information linked to each other in a specific format in order to secure specific needs of students' requirements.

## **2.2 Previous Studies.**

The previous studies are considered a literature that provides the researcher with scientific facts that will serve his study and guide in construction of the study in its initial form and from which it starts, and is considered a source of inspiration to choose topics of importance, and accordingly I have reviewed the studies that dealt with the use of blended learning as a method of teaching. The following is a review of these studies arranged chronologically (from newest to oldest).

Alraey,amjaed (2014 ).his study aims to investigate the effectiveness of Differentiated Instruction Strategy (DIS) in teaching mathematics on acquiring mathematical concepts and the tendency towards mathematics by seventh grade students. To achieve this aims, study main question was the following: What is the effectiveness of DIS in teaching mathematics on acquiring mathematical concepts and the tendency towards mathematics by tenth grade students? Study sub questions are:

1) What are the mathematical concepts to be taught for 10th grade students in sets unit?  
2) What is the proposed general framework to teach mathematical concepts through using Differentiated Instruction Strategy?

3) What is the effectiveness of DIS in acquiring mathematical concepts by 7th grade students?

4) What is the effectiveness of DIS in developing students' tendency towards mathematics by 7th grade students? To answer these questions, the researcher put the following hypotheses:

1) There are no statistical significant differences at level ( $\alpha \leq 0.05$ ) between students' grade averages at the control and experimental groups regarding the mathematical concepts posttest.

2) There are no statistical significant differences at level ( $\alpha \leq 0.05$ ) between students' grade averages at the control and experimental groups regarding the post scale of tendency towards mathematics. To fulfill study goals, the researcher constructed study tools, including content analysis for "sets" unit to gain the mathematical concepts. The tools also included a 25-item test for mathematical concepts, a 26-item tendency scale, and teacher's guide on using DIS in teaching. The researcher adopted the experimental method and he intentionally chose Saad Bib AbiWaqas (A) School. The study was applied on 80 students from two classes representing the sample. The classes were selected randomly and each one consists of 40 students. One of them was the experimental group, which received DIS teaching and the other was the control group, which was taught by the traditional way. The researcher assured that both groups have same age students, general acquisition, and previous acquisition in mathematics. Moreover, he made sure that both groups were equal in results of the pre mathematical test and the pre tendency scale. After collecting results, the researcher used t-test for two independent samples to measure the differences between students' grade averages in the experimental and control groups in concepts test and tendency scale. He also measured Eta-Square to identify the impact size of DIS on acquiring concepts and tendency towards mathematics. The study shows the following results:

1) There are statistical significant differences at level ( $\alpha = 0.01$ ) between students' grade averages at the control and experimental groups regarding the mathematical concepts posttest in favor of experimental group.

2) There are statistical significant differences at level ( $\alpha = 0.01$ ) between students' grade averages at the control and experimental groups regarding the post tendency scale in favor of experimental group. In light of these results the researcher recommended:

1) Use the differentiated instruction Strategy in the education process and include it in teacher's guide for mathematics.

2) Hold training courses and workshops for teachers to train them to use DIS.

3) Take into consideration, by curricula authors, DIS upon developing and establishing books.

4) Include DIS in modern teaching methods to be taught at faculties of education.

5) Enrich the libraries with references about DIS.

Al-Ababsa (2012) conducted a study aimed at identifying the effect of teaching physics using blended learning and e-learning on achievement and the trend towards physics through the computerized curriculum on the eduwave among the tenth grade students in Aqaba governorate. The study sample consisted of (116) female students from That Al-Sawari school, the researcher used in this study two tools (achievement test and scale measuring attitude towards the material), and the goal of these tools and their reliability were verified, and the results showed statistically significant differences in achievement at ( $\alpha \leq 0.05$ ) and in favor of blended learning. The results also showed the existence of an effect of both blended learning and e-learning on the students' attitude towards physics, as this study concluded that the use of blended learning and the preference of computerized curricula in eduwave due to their positive impact on female students.

Al-Huwaiti (2011) conducted a study aimed at identifying the effect of using the blended learning method on the mathematical achievement of fourth-grade students in the Kingdom of Saudi Arabia, and its impact on developing their attitudes towards mathematics, and to achieve the goal of the study, the study tools represented

in a computerized educational program for two units of fourth grade mathematics book were prepared, in addition, an achievement test designed to measure student achievement, and attitude scale toward mathematics. The validity and reliability of these tools were verified. These tools were applied to the study sample, which was purposively chosen and it consisted of (41) fourth grade students in a school in the kingdom of Saudi Arabia. The results of the post application showed that there were statistically significant differences at the level of ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group students and the mean scores of the control group students in favor of the experimental group in achievement. This indicated the effectiveness of the blended learning method in students' mathematical achievement. The results also indicated the existence of statistically significant differences between the two groups in the students' attitudes towards mathematics in favor of the experimental group.

### III. Methodology and design.

This chapter deals with a presentation of the study population, its sample, and the procedures that were followed to conduct the study, to conduct the study, and included a description of the tools and statistical treatments that were used

#### 3.1 Study population.

The study population consisted of all male and female students in the tenth grade in government schools in Al-Qadisiyah governorate, which include (152) government schools. The number of students in Tenth grade (2148) male and female students

#### 3.2 The study sample.

The study sample consisted of four classes of students in the tenth grade, as follows: two sections of males from Al-Husseineh School for Boys, one of them is control (31) students and the other is experimental (34) students. Two sections of female students from Al-Mazar school. (36), (39) female students, and the sample was purposively chosen. The two schools were chosen because they were equipped with modern computers connected to the Internet and supported by data show devices to facilitate the learning process.

**Distribution of study sample individuals according to the study variables. Table No. (1):**

Teaching method	(Male)	(Female)
1 - Traditional method	31	35
2 - Blended learning	34	39

Equivalence of the experimental and control groups was confirmed in achievement through a pre-test. The groups were taught by Math teachers in each school

Two study tools.

#### Two tools were used for the study:

##### The first tool: the educational material.

The tool was developed by preparing classroom lessons according to the blended learning method by combining explanation in the traditional method and using the media in the computerized curriculum. That was after reviewing the developed educational material and then reviewing the computerized curriculum on the Internet on the ministry's website (Eduwave) then making use of it in developing this unit. Appendix (A) shows the instructional material

The unit title was "the electronic structure of the atoms of the elements that determine their chemical behavior".

**Table (2) :The arithmetic means and standard deviations of the performance of the students of the two groups on the pre-achievement test.**

Groups	( arithmetic means)	(standard deviation)
1 - Control	13.70	4.85
2 - Experimental (blended learning)	15.32	4.32

It is clear in Table (2) that there are apparent differences between the performance of the students of the two groups on the pre-achievement test, and to find out whether these differences are statistically significant, (t) used for independent samples, and Table (3) shows that.

**Table (3): (t)test for the independent sample to find out the significance of the differences between the performance of the students of the two groups on the pretest.**

Source	standard error	(d.f)	(t)	Level ofsignificance
Achievement	0.822	139	2.013	0.099

The table showed that there were no statistically significant differences at the level of significance ( $\alpha \leq 0.05$ ) between the two groups in the pre-achievement test, where the value of (t) = (2.013) and the significance level = (0.099), which indicates the equivalence of the two groups.

### 3.4 Study procedures

Having conducted research and identified the study problem and its questions and determined the variables to be measured, the researcher took the following procedures.

1. Forming a scientific and educational structure for the researcher and preparing study tools with the help of educational literature from Arab and foreign literature review and previous studies.
2. Building the educational material and achievement test.
3. Presenting the tools to a group of arbitrators to ensure their validity and then applying them to a pilot sample and measuring the reliability factor to ensure the reliability of the tools.
4. Addressing the Ministry of Education to facilitate the researcher's task in applying the study.
5. Teachers were trained how to use the teaching method, and the achievement test was applied as a pre-test on the control and experimental groups to ensure their equivalence.
6. Following-up the educational material developed on the basis of this study(9/2/2019 - 10/3/2020 ) and communication through the visit and follow up the lessons with teachers.
7. Re-applying the achievement test as a post-test on the study sample on 11/3/2020.
8. Checking test answer sheets and listing students' score.
9. Keepingscores and processing them graphically according to the Statistical Package System (SPSS).
10. Analyzing and discussing the findings of the study.

### 3.5 The reliability of test:

The test reliability was detected after its application on pilot sample outside study sample.

The sample consisted of (25) female students from Mutah Secondary school for girls. The clarity of questions , test timing (45 minutes) were determined. The internal consistency method was used for test items by calculation of (KR 20) coefficient which was ( 0.95 ).

Discrimination and difficulty coefficients for achievement test items:					
Number	difficulty coefficient	Discrimination coefficient	Number	difficulty coefficient	Discrimination coefficient
1	0.80	0.339	14	0.89	0.382
2	0.66	0.538	15	0.51	0.325
3	0.82	0.458	16	0.57	0.369
4	0.75	0.285	17	0.50	0.593
5	0.60	0.412	18	0.65	0.448
6	0.52	0.312	19	0.54	0.281
7	0.21	0.107	20	0.64	0.452
8	0.47	0.235	21	0.89	0.413
9	0.59	0.536	22	0.72	0.413
10	0.75	0.526	23	.830	0.381
11	0.80	0.437	24	0.76	0.447
12	0.65	0.388	25	0.83	0.324
13	0.67	0.401	26	0.48	0.478

As seen in table (4) difficulty coefficients for test items were between (.021 \_ .089) while discrimination coefficients were between (.011\_ .06) and these coefficients were acceptable so all items were adopted.

The achievement test was applied to control and experimental group as a pre test to detect equivalence . Table (4)showed arithmetic means and standard deviations for students performance on pre test to detect the equivalence of the two groups.

**3.6 Study variables:**

**First: the independent variables**

1-The method of learning and its levels.

A- Traditional learning.

B- Blended learning.

2-Gender (males – females).

**Second: Dependent Variables**

1-Achievement: tenth grade students' achievement in Math.

**2-Statistical treatments:**

The following statistical operations were performed to process the data and answer the study questions.

1-arithmetic means and standard deviations

2-Analysis of variance (ANCOVA).

**3.7 Presentation and discussion of results.**

This study aimed to investigate the impact of blended learning - based program on the achievement of students in the tenth grade in Math, and the following results achieved are:

To answer these questions, an analysis of variance (ANCOVA) was used, and the results are shown in Table (5).

**Table(5) :Results of the analysis of co-variance (ANCOVA) of the performance of the two groups and its effect on the interaction between method and gender.**

Source	sum of squares	d.f	means of squares	(f) value	Significance Level
<b>Method</b>	155.23	1	155.23	12.85	0.0001
<b>Gender</b>	21.45	1	21.45	1.43	0.311
<b>Interaction (Gender +method)</b>	44.23	1	44.23	3.87	0.082
<b>Error</b>	1456.57	136	13.49		
<b>Total</b>	1753.61	139	149.66		

**1.Results related to the first question: Was there a statistically significant difference at the level of significance ( $\alpha \leq 0.05$ ) in tenth grade achievement in the Math due to the teaching method (blended - traditional)?**

After the implementation of the educational program was completed, the post-test was applied to find out the differences between the two groups in achievement in Math, the arithmetic means and standard deviations of the students' performance on the post-achievement test were measured. Table (5) shows the results obtained. It was evident through Table (4) that there were apparent differences that showed the arithmetic means of the performance of the students of the two groups on the post-test. The average performance of the control group was (15), less than the performance of the experimental group students. The average performance was (18.73). As seen in table (4), there were statistically significant differences at the level of significance ( $\alpha \leq 0.05$ ) between the two groups in the post-measurement where the value of (f) = (14.89), and the level of its significance is equal to (0.0001), which is a statistically significant value. As far as the arithmetic means of the two groups are concerned, the difference in achievement was in favor of the experimental group, which is attributed to the learning method (blended learning), where the arithmetic mean of the experimental group was (18.73), which is higher than the arithmetic mean of the control group (15).

After the results of the first study question showed that there was a statistically significant difference at the level of significance ( $\alpha \leq 0.05$ ) in tenth grade achievement in Math ascribed to the teaching method, where the results showed that the group that studied using blended learning outperformed the control group.

This result can be attributed to the fact that the blended learning method is a new method for students that led to their motivation and increased perseverance and motivation to learn, which enable the experimental group to outperform the control group that learned through traditional method and did not deviate from the routine to which students are accustomed. It is also possible that the reason can be attributed to the role played by the teacher, as he was not instructor as in the traditional method nor as a guide as in the e-learning method. Rather, it lighted the importance of the teacher's role which is indispensable for students even with the prevalence of modern educational technological means and media.

**2.Results related to the second question: was there a statistically significant difference at the level of significance ( $\alpha \leq 0.05$ ) in the achievement of tenth grade students due to gender (male, female)**

In order to be able to answer this question, the arithmetic means and standard deviations of the mean of the two sexes were measured on the post-achievement test, as shown in Table (5):

It is evident in Table (4) that there were apparent differences that showed the arithmetic means of the two sex's scores in the achievement test. The mean of the male scores (16.07) was less than the mean of the female scores (17.56).

It was noticed from the table that the level of significance was equal to (0.214), which was greater than the level of significance ( $\alpha \leq 0.05$ ), noting that the arithmetic mean of female scores was higher than that of male ones and that females were more homogeneous than males, but these numbers were not considered statistically significant, and therefore we accept the null hypothesis that states that there was no statistically significant difference at the level of significance ( $\alpha \leq 0.05$ ) between the means of the 8th grade scores in Math attributable to gender.

The reason for this can be attributed to the similar educational conditions that govern the environment of both sexes, which have made learning opportunities somewhat equal, as the curricula they learn are the same, and the school capabilities and infrastructure are almost the same in the schools in which the study was conducted. All male and female teachers undergo similar programs of preparation and qualification- programs provided by the Ministry of Education- and we do not forget that the students of the two groups were from one social and cultural environment, and that cultural awareness in Jordan in general and in the study environment in particular does not differentiate between male and female in terms of interest in learning Especially since universities are spread in all governorates, which makes the university accessible not only for males, but also for females.

### **3.Results related to the third question: Was there a statistically significant difference at the level of significance ( $\alpha \leq 0.05$ ) due to the interaction between teaching method and gender?**

To answer this question, ANCOVA was used, and the results are shown in Table (5). It was noted from the table that there was no statistically significant difference at the level of significance ( $\alpha \leq 0.05$ ) between the mean scores of the study groups in the achievement test in Math due to the interaction between the method of gender-based learning as the value of (f) calculated in the interactive variable between the method of learning and gender is equal to (0.075) which is less than the critical value (f). This confirmed that there was no statistically significant difference at the level of significance ( $\alpha \leq 0.05$ ) due to the interaction between the learning method and gender

The similarity in the educational, social and cultural environments of both sexes and the positive acceptance of male and female students may be among the reasons this result attributed to, as well as the renewed competition between male and female students to reach the highest levels, which drives the status of males or females in society and directs attention towards it

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