The Effectiveness of Blended Learning in Improving Students' Achievement in Third Grade's Science in Bani Kenana

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Abstract
The study aimed at identifying the effectiveness of blended learning in improving students' achievement in the third grade's science in the traditional method. The study sample consisted of (108) male and female students, who were divided into two groups: experimental and control. The experimental group studied the units and changes of the material and the parts and functions of the plants for the third grade through using the blended learning while the control group studied the same units in the traditional method.An achievement test was developed in the mentioned units of the science course to measure the achievement, which had a sufficient validity and reliability. It was applied to the study sample; the appropriate statistical analyzes were conducted. The results indicated the presence of statistically significant differences in the post-achievement due to the teaching method in favor of the experimental group, the presence of a statistically significant difference in the post-achievement due to gender, in favor of males and lack of a statistically significant difference in the post-achievement due to the interaction between the method and gender.
Keywords: blended learning, third grade, science, achievement.

1. Introduction

The past decade has witnessed a huge revolution in the educational applications of the computer, whose use in education is in its beginning taking various forms starting from using computers in education to the use of the Internet in education and finally emerged the concept of blended learning, which depends on technology to provide the educational content to the learner in a good and effective method. Many educators recommend the importance of making adjustments in the curriculum to keep up with the age of computer and information technology but there is no agreement on the type and amount of the required modification; most parents, students and teachers believe that the preparation of young generations and arming them with the basics of computer science and use is the most appropriate way to rehabilitation so they can stay in the changing world; the prevailing viewpoint in the developed societies is that the school has no choice but to adapt to the information age because this adjustment has become necessary for the continued survival and progress (Bani Hamad, 2011).

Blended learning is one of the most modern methods of learning helping in solving the knowledge explosion problem, the growing demand for education and the problem of overcrowded lectures if used in distance learning, expanding the acceptance opportunities in education, being able to train, educate and rehabilitate workers without leaving their jobs and teaching housewives, which contributes to raising the literacy rate and eliminating illiteracy; blended learning increases the learning effectiveness to a large degree, decreases the time environment required for training, decreases the training costs, allows the learner to study at his favorite time and place, allows for live interviews and discussions on the network, provides updated information suiting learners' need, and provides simulations, animations, practical events and exercises and practical applications (Al- Shunnaq and Bani Domi, 2010).

blended learning is one of the contemporary trends of education and one of the new trends of the teacher in the twenty first century; it can be described as an educational method in which more than one means is used for transmitting knowledge and experience to learners to achieve the best of the learning outputs (Freihat, 2004); accordingly, this model combines the advantages of e-learning and the benefits of classroom education; this education is based on the integration between the traditional learning and e-learning (Al-Rimawi, 2016).

There are several definitions of blended learning; (Ismail, 2009) defined it as the employment of technological innovations in blending the two methods of education face-to-face as well as distance education to bring about an interaction between the faculty member being a teacher or a mentor with learners face-to-face through these innovations, which are not required to have specific electronic tools or specific quality with the availability of learning sources linked with content and learning activities. Hassan (2010) sees that it is a way of learning aiming to help the learner achieve the targeted learning outcomes through the blending between the forms of traditional education and e-learning with its patterns inside and outside the classroom.

(Salamah, 2005) indicated some features and characteristics that distinguish blended learning as providing a face-to-facecommunication, which increases the interaction between the student and the trainer, (teacher) and students, students among each other, and students and content, and reduces the teaching costs through increasing the learning proportion to cost, enhancing the humanitarian aspects and the social relations between learners and teachers, meeting the needs of each learner according to his abilities, integrating the

structural and final evaluation systems, transmitting from the collective learning pattern to the learning concentrated on the student and using the physical and virtual materials in the best way. Blended learning is also beneficial in using the technological development in the design, implementation and use, supporting the traditional teaching methods used by the faculty staff in appropriate interactive learning, providing training members in the job or study environmentthrough using a minimum amount of efforts and resources to gain the maximum results, and finally enabling individuals to continuously apply skills to become a habit with practice.

(Al-Faqqi, 2011) identified several models for the blended learning, which are:

1. the learning model which leads the skill combining the self-paced learning and supporting the development of certain knowledge requiring a feedback and organized support from the teacher that the interaction with the teacher is blended through the e-mail, discussion forums, and face-to face meetings through the self-paced learning such as books and courses listed on the Internet; this type of treatment is identical to the chemical reaction, in which the interaction with the teacher acts as a motive for achieving the reaction required for learning.

2. The learning model which leads the trend and blends varied events and means for developing certain behaviors requireslearners' interaction with each other as well as a risk-free environment.

3. Efficiency-led learning model, which integrates the tools of supporting the performance with the sources of knowledge management and consultations to develop specific competencies to capture and transfer the implied knowledge that requireslearners' interaction with experts in the specialty.

A group of basic rules are considered during redoing and implementing the blended learning (Al-Rimawi, 2014):

1. Choosing the topic: we have previously said that the appropriate topic is one of the basic concepts, not one of the facts or skills; the concept is richer and more fertile and linked with the various topics of the study while the truth or the main skill is linked with one of the topics.

2. It is preferred to implement the blended lesson through the concept of mutual relations in a company or market.

3. The blended topic can continue for a whole year but this requires fundamental changes in the curriculum and school systems.

4. The teacher uses varied teaching methods: discussions, visits, research shows and collaborative work.

5. Identifying the related subjects.

6. The teacher prepared the questions, activities and exercises that help students study and achieve their goals.

7. Students begin by choosing activities, conduct the study and collect data.

8. The teacher is informed with the school curriculum in its different topics.

(Salameh, 2005) shows several problems of blended learning, some of which is that some students lack the sufficient experience or skills for dealing with the computer and the Internet networks, which represents the most significant obstacle to the blended learning especially if we are talking about a kind of self-learning; another problem is the absence of any guarantee for any of the devices for learners in their homes or places where they teach the course electronically at the same efficiency, capacity, speed, and equipment, and it is suitable for the systematic content in addition to the presence of many difficulties in the networking and communications systems and speed; one of the most important problems of blended learning is the non-availability of qualified personnel in this type of learning.

2. Previous Studies

One of the studies on blended learningis (Maccoun, 2016), Which aimed to explore the effect of using the blended learning in students' achievement and information preservation for the fifth graders in the biology course. One of high schools of the city center of Baghdad was randomly selected, from which two random sections were chosen: one represents the experimental group, which studied viablended learning, and the other represents the control group, which studied via the traditional learning. The total sample size was 60 students after statistically removing 5 failing students that each group consisted of (30 students). An achievement test consisting of (30) multiple-choice items was prepared and the study validity and reliability were checked. The results expressed the superiority of the experimental group to the control group in the achievement test and information retention.

(Al-Rimawi, 2014), which aimed to investigate the effect of blended learning on the direct and delayed achievement of the sixth graders in the English language course; to achieve the objectives of the study, the quasi-experimental approach was used, and the researcher prepared an achievement test, whose validity and reliability were checked. The study members consisted of (60) students of Um-Qasir School for boys in Quwaismeh, Amman who were distributed into two groups: experimental and control. The study results showed the presence of statistically significant differences between the means of the direct and delayed achievement for the members of the experimental group.

(Al-Ajab, 2006) aimed to explore the effect of the blended learning which combines the distance e-learning and face-to-face leaning in teaching computer skills to studentsin the pre-medicine stage in the Arabian

Gulf University in Bahrain; the study sample included 157 students who were registered in the computer skills course in the Arabian Gulf University. Through assessing the results of the inputs taken from students on the (Web cat) of the course topics through the system and questions related to the topic, the results concluded that the method of blending between the distance e-learning and face-to-face learning proved valid and it developed the educational skills needed by students in their future studies.

(Al-Hasan, 2013) aimed to identify the technology of blended learningand the effect of using it on the academic achievement in the biology course among the second graders in the private secondary schools and their trends towards it. To achieve this objective, the researcher followed the approach and a random sample of 41 students was selected from the private secondary schools; they were divided into two unequal groups: experimental consisting of (26) students who studied via the blended learning technology, and The control group consisting of (25) who were taught in the traditional method. Data were collected by using two tools: achievement test and a questionnaire to measure the trend towards blended learning. The data was treated through using the appropriate statistical methods. The research concluded that there are statistically significant differences in favor of the students who have studied through the blended e-learning (the experimental group) and that there are statistically significant positive trends among the members of the sample who responded to the items of the questionnaire of the trend measurement towards blended learning.

(Shahin, 2008) aimed to measure the extent of the effectiveness of the blended learning on achievement and develop the science operations among the fifth graders in Al-Naser Experimental School in Tanta and their trends towards it. The most important results of the study reached to the effectiveness of blended learning since it combines the e-learning and the traditional learning helping provide the educational materialsin many and different ways through the presence of a statistically significant difference in many ways between the marks' means of the experimental group which studied via the blended learning and the degrees of the control group which studied through the traditional way in the post application of the achievement test in science in favor of the experimental group. Also, there appeared statistically significant differences between the mean of the students' marks in the experimental group in the post-application for the trend's scale towards the blended learningin favor of the experimental group.

2.1. Commenting on Previous Studies

Many studies showed the effectiveness of the blended learning compared with the traditional way as (Maccoun, 2016); there are studies that showed a statistically significant difference in the student's achievement due to the method of the blended learning as (Al-Rimawi,2014), studies focusing on the trends and development of skills such as (Al-Hassan, 2013), studies concerning with the fundamental stage as (Shahin, 2008), studies on the high level as (Maccoun, 2016), and studies on the stage of university education such as (Al-Ajab, 2006). This study is consistent with some of the previous studies in focusing on the blended learning. such studies were beneficial in the methodology and design of the current study and the structureof its tools'. This study differs from the previous studies in focusing on the third graders who consider the blended learning a vital source in learning science and a main entrance for their mental and physical growth.

3. Study Problem and Questions

given the low basic level of the third graders in achievement in science and the non-feasibility of the various techniques used for these targets, the study problem was identified through searching for the effectiveness of the blended learning in developing the achievement of students in the third grade science in Bani Kenana by answering the following question: does the arithmetic mean of the students'performance on the achievement scale differ in improving the students' achievement in science as a whole depending on the variable of (teaching method and gender) and the interaction between them? The null hypothesis was extracted; it states: There is no statistically significant difference at ($\alpha = 0.05$) between the arithmetic means of the students'performance on achievement in science as a whole due to the variable of (teaching method, and gender) and the interaction between them.

3.1. Study Importance

- The importance of the current research stems from its topic, blended learning,and it is conducted to consider blended learning an invented technique in teaching and developing the teaching methods used in teaching science in the elementary schools by providing a new method of teaching where the information technology and communication is used without the need for a radical change in the traditional methods; the reason is that the blended learning method does not rely on the traditional methods but it works to improve them by integrating them with the electronic methods.

- focusing on activating the blended learningtechnique in the educational process and in the teaching of the basic stage, in particular.

- providing a guide for the teachers and writers of science in the elementary stage for the references it contains

on using the novel technologies and the global network of information (the Internet) in particular to enrich the topics; such topics are identified along with the websites,the computerized software and the traditional methods of teaching.

3.2. Study Limitations
This study included the following limitations:

1. This study was limited to the effectiveness of the blended learning in improving the achievement of students in science of the third graders in Bani Kenana.

2. This study was limited to a sample of male and female third grade students in Ibn Sena School for boys and Kafr Soom School for girls that are both located in Bani Kenana, that are registered in the second semester of the academic year 2016/2017.

3. Thestudy schools were chosen from among a group of schools due to their approval for applying the procedures of the study and providing the appropriate assistance of the job.

4. The scale of the achievement of the scientific concepts is identified through a test prepared for the purposes of the present study.

3.3. Operational Definitions
- **Blended Learning**: (Harriman, 2004) defined it as a type of education that combines various educational activities such as face-to-face learning in the classroom and the live e-learning. (Khamis, 2003) defined it as an integrated system designed to help the learner through each stage of learning since it is based on combining the traditional learning and e-learning with its various forms within classrooms.

- **Achievement**: it is the result of what was learned by the students directly after the end of the educational material. It is measured by the total marks obtained by the student in the test, which was prepared for this purpose.

- **Third Grade**: all the students studying during the first semester of the year 2016/2017.

4. Study Approach
The researcher used the quasi-experimental approach due to its suitability to the nature of the study and its ability to achieve its goals by using the post measurement for the experimental and control groups.

4.1. Study Population
The study population consisted of all the third grade students in the schools of Bani Kinana who are registered in the academic year 2016/2017; they amounted to (1954) male and female students.

4.2. Study Sample
the study sample consisted of (108) male and female students from the thirdgrade, who were randomly chosen from one school for boys and another school for girls since they contain the necessary facilities for conducting the study; the study groups were distributed randomly to two groups: experimental and control. The members of the experimental group consisted of (54) male and female students by (27 males and 27 females) while the number of the members of the control group was (54) students by (27 males and 27 females).

5. Study Tools
To achieve the objectives of this study, the following tools were used: -

5.1. First, the Educational Material: it is divided into two Sections
- Blended LearningMethod and its Implementation Mechanism

The researcher has agreed with the male and female teachers in both schools to teach students according to the blended learning, ensure the readiness of teachers' knowledge in using computers and their training courses for the ICDL and Intel, ensure the availability of the computer lab in the two schools as well as the readiness of computers, and provide adata show. The worksheets and the computerized activities related to the units and changes of the material and the parts and functions of the plants are discussed with the people conducting the study.Ease of access to such worksheets and activities was confirmed along with the possibility of printing them if necessary and moving through the mentioned units. The researcher also checked that teachers should mix the two ordinary methods and use the computerized curriculum regardless of the time spent in each; however, the computerized material was not provided for the students who have studied in accordance with the ordinary way.

Educational Material

This study was applied to the units and changes of the material and the parts and functions of the plants for the third grade whose application required (25) classes on five weeks by five classes per week for each group. The study included the content related to science and the lessons consisted of many educational means and tools

blending the learners with the effectiveness of using the technological means and the ordinary method through which students learn; teachers use data shows connected with laptops to display the educational means to enrich the classroom interaction and they move with complete flexibility with the educational material. The computerized lessons were built through a certain pattern and mechanism through recalling the previous experiences of the new lesson, followed by a presentation of the educational objectives and outcomes; then the teacher displays an activity and allows students to work with him. Independency by students is represented with their job and use of blended learning in implementing activities. This is accompanied by the interaction and motivation of the teacher and students. The lesson also includes worksheets used by the students to provide answers related with the use of the blended learning.

- Educational Material Related to the Traditional Method of Classroom Teaching:
The educational material used in this study consisted of units and changes of the material and the parts and functions of the plants that will be taught in the science course (Part I) for the third grade issued by the Ministry of Education for the academic year 2016/2017. The behavioral objectives expected to be achieved were identified to teach topics whose variety was taken into account in terms of the fields and levels; the male teacher of the third grade taught the educational material related to the ordinary classroom teaching for the male students and the female teacher of the third grade taught the material for the female students adopting the traditional methods.

5.2. Second: Achievement Test
The researcher prepared an achievement test to measure the effectiveness of the blended learning in improving students in science. The test in its final image consisted of (20) multiple-choice questions after being presented to a group of experts with knowledge in the third grade consisting of male and female supervisors and teachers. Each branch of the questions were given one mark for the correct answer and zero for the wrong answer; the maximum mark of the test was (20) and the testing time was 45 minutes.

5.3. Validity and Reliability of the Achievement Test:
The validity of the test items was checked through being presented to a group of (12) arbitrators and a questionnaire on the test items was distributed to them consisting of all the items of the test. After taking the viewpoints and suggestions of the arbitrators, the researcher replaced some items with another and the test in its final form consisted of (20) multiple-choice items.

The test reliability was checked through applying the test on an exploratory sample from outside the study sample and the Pearson correlation coefficient was calculated where the reliability reached (0.87), which is considered appropriate for the purposes of this study.

6. Study Procedures
The study was conducted in the following procedures:
1. Preparing an achievement test suiting the students, the required material, and the educational goals in the textbook.
2. Getting a letter from Bani Kenan Directorate of Education to the principles of the schools of the study, coordinating with the management of both schools to conduct the study, implementing the lessons for the experimental group by the blended learningand implementing them for the control group in the traditional method, and finally agreeing with the third grade teachers of both schools to conduct the study.
3. Determining the study community and members where the members of the study were divided into two groups: experimental consisting of 27 male students and 27 female students that were taught by the blended learning and a control group, which consisted of 27 male students and 27 female students who were taught in the traditional method.
4. Starting with applying the blended learning on the study sample for two months by two classes a week with the total of (16) classes by 45 minutes for each class.
5. The equivalence of the teachers of the experimental and control groups were taken into consideration in terms of expertise, efficiency and ability to teach.
6. The post- test was applied and the test time was 45 minutesto measure the improvement of the students in the experimental group immediately after completing the implementation of the educational aspects of the material.

7. Study Variables:
1- Independent variables
 - Teaching method: it has two levels: blended learning and the traditional method.
 - Gender: It has two levels: male and female.
2- Dependent Variables:
- Post-Achievement: it is for the third graders in learning the units and variables of the material and the parts and

functions of the plants.

8. Statistical Treatment

To answer the study question, the researcher used the statistical methods through calculating the arithmetic means and standard deviations of the members of the study sample on the achievement test in developing the reading skill and applying the Two Way ANCOVA; to find the effective way, the effect size was used through Eta square.

9. Results

First, the results relating to the first question, which states: Does the arithmetic mean of the performance of students on the achievement test in improving students' achievement in science as a whole depending on the variablesof (teaching method and gender) and the interaction between them? The null hypothesis was derived from it; it states: There is no statistically significant difference at (α = 0.05) between the arithmetic means of the students' performance on the achievement in science as a whole due to the variables of (teaching method and gender) and the interaction between them.

To answer this question and test the null hypothesis, the researcher calculated the arithmetic means and standard deviations for the marks of the members of the study sample on the achievement test in improving students' achievement in science as a whole, according to two variables: teaching method (teaching method through the story and the ordinary method) and gender (male and female). The results were shown in table 1.

Table (1)
Arithmetic means and standard deviations for the marks of the members of the study sample on both the pre and post achievement tests in improvingthe students' achievement in science as a whole according to the variables of: teaching method and gender

Gender	Descriptive statistics	Pretest			Posttest		
		Control	Experimental	Total	Control	Experimental	Total
Male	Number	27	27	54	27	27	54
	Arithmetic mean	2.67	2.74	2.70	15.85	19:15	17:50
	standard deviation	1.39	1.16	1.27	3.37	1.06	2.98
Females	Number	27	27	54	27	27	54
	Arithmetic mean	2.56	2.11	2.33	15.70	17:11	16:41
	standard deviation	1.28	1.05	1.18	2.87	2.67	2.83
Total	Number	54	54	108	54	54	108
	Arithmetic mean	2.61	2.43	2.52	15.78	18:13	16.95
	standard deviation	1.32	1.14	1.23	3.10	2.26	2.95

Table (1) shows that there is a virtual difference between the means of the students' marks on the achievement pretest in science as a whole in the experimental and control groups and between males and females. To identify the level of the statistical significance of the differences in the arithmetic means of the marks of the students on the post-achievement as a whole in improving the students' achievement in science according to the variable of the teaching method (blended learning and the traditional method), and the interaction between the teaching method and gender and to isolate (delete) the differences in the performance of students on the pre-test, the researcher applied the (Two way ANCOVA) at the statistically significant level of (α = 0.05). The results were as shown in table (2).

Table (2)
Results of two- way ANOVA associated with the grades of students on the post achievement test as a whole in improving the students' achievement in scienceaccording to the variables of method of teaching, gender and the interaction between them

Source of variation	Sum of Squares	Degrees of freedom	Average Squares	P value	Statistical significance	size Effect
Accompanying (pre)	0.330	1	0.330	.047	.829	0.000
Teaching method	147.393	1	147.393	21.004	* 0.000	.169
Gender	32.474	1	32.474	4.628	* 0.034	.043
Teaching method × gender	24.411	1	24.411	3.479	0.065	0.033
Error	722.781	103	7.017			
Total	927.389	107				

* Statistically significant at the level of statistical significance (A = 0.05)

The results in Table (2) show that there is a statistically significant difference at the level of statistical significance (α = 0.05) between the mean of the students' marks on the achievement posttest in improving students' achievement in science as a whole in two groups: experimental (which studied through the blended learning), and control (which studied through the traditional method). The value of the calculated (P) is (21.004), which is statistically significant at the level of statistical significance (α = 0.000); to determine the value of the differences in the means of the students' marks in both groups in the achievement post-test in science,the modified arithmetic means were calculated to isolate the effect of the performance of the two groups in the pre-test on their performance in the post-test; the results are in table 3.

Table (3)

Adjusted arithmetic meansfor the marks of the students in the experimental and control groups on the post-achievement test posttest in improving students' achievement in science after isolating the effect of performance on the pretest

Group	Average mean	Standard error
Experimental	18:13	0.36
Control	15.78	0.36

The results of the modified arithmetic mean in table (3) for the students' marks in the two groups on the achievement posttest in science as a whole after isolating the effect of performance on the pre-achievement in improving students' achievement in science as a whole show that the differences were in favor of the experimental group (which was taught by the blended learning) that it had (18:13 mark) as a modified arithmetic mean, which is higher by a statistical significance from the modified arithmetic mean of the control group, (who was taught by the traditional method) amounting to (15.78).

To find the effective way, we have found the Effect Size through using Eta Square, which was (16.9%); this means that teaching-via blended learningexplain (16.9%) of the variation in the arithmetic mean of the performance of students on achievement in improving the students' achievement in science as a whole.

Table (2) also indicates the presence of a statistically significant difference at the significance level (α = 0.05) between the mean of the students' marks on the achievement post-test as a whole in improving students' achievement in science in the two groups (male and female) in favor of males;the value of (P) was (4.628), which is statistically significant at the level of statistical significance (α = 0.05) while the results showedno statistically significant difference between the mean of the students' marks on the achievement test posttest in science as a whole depending on the interaction between teaching method and gender as the calculated (P) value was (0065), which is not statistically significant at the level of statistical significance (α = 0.05).

10. Results Discussion

First, discussing results related to the hypothesis: there is no statistically significant difference at (α = 0.05) between the arithmetic means of students' performance on the achievement test in science as a whole due to the variable of the teaching method. The results of this question showed a statistically significant difference at the level of (α = 0.05) for the achievement test of the second graders in science "improving students' achievement," for the benefit of the members of the experimental group, which have studied via the blended learningmethod, compared to the students of the control group, which have studied via the traditional method. The reason for the superiority of the experimental group on the control group onthe effect of the teaching (blended learning) in improving students' achievement in scienceis due to the fact that the blended learning as a teaching method banished students' boredom through educational situations and provided them fun during learning in an interesting and fun atmosphere which they never experienced before. Another reason for the excellence of the experiment group goes to the fact that blended learning provided students with a new method in education, in which students felt pleasure, attraction and interaction. These results are consistent with most of the previous studies indicating the effectiveness of the blended learning as (Maccon, 2016) and (Al-Rimawi, 2014).

Second, discussing the results of the hypothesis: there is no statistically significant difference at (α = 0.05) between the arithmetic means of the students' performance on the achievement test in improving students' achievement in science due to gender. The results showed the presence of a statistically significant difference at the significance level (α = 0.05) between the mean of the students' marks on the achievement post-test as a whole in improving students' achievement in science in the two groups (male and female) in favor of males. Despite the fact that teaching via prepared blended learningin content did not go beyond theireducational goals and the educational content in the textbooks regardless of their gender; this result is attributable to the significant males' ability to remember and retain information for a longer period of timein addition to the interest shown by males in dealing with educational situations compared to that shown by females, and the accuracy, follow-up and proper dealingwith the textbooks by the males. It may also be attributed to the atmosphere of competition between males and females, which led to raising the level for the males leading to more motivation toward

learning.

Third, discussing the results of the hypothesis: there is no statistically significant difference at ($\alpha = 0.05$) between the means of the students'performance on the achievement test in improving students' achievement in science due to the interaction between gender and teaching method. The researcher attributes this result to gender equality in terms of the opportunities provided to them by this study, the conditions and variables that correspond to the present study, in addition to the teaching methods used that are related to the development of students' skills and their different abilities regardless of their gender, which all seek to increase students' achievement. This result may be attributed to the fact that the differences between males and females' performance on the test were regular and that the use of blended learning in teaching fits males and females at the same level in the field of keeping learning. The result of this question is consistent with (Al-Ajab, 2006), which pointed to the lack of a statistically significant difference due to the interaction between the teaching method and the gender of students.

11. Recommendations

In light of the findings of the study, the researcher recommends the following:
- The need for training the teachers of the first three grades and encouraging them to learn using the blendedlearning in teaching.
- studying the effect of using blended learning in teaching within other teaching results and variables.

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