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THE EFFECTIVENESS OF USING MOBILE PHONE APPLICATIONS IN VIRTUAL LABORATORIES ON ACADEMIC ACHIEVEMENT IN CHEMISTRY FOR STUDENTS OF THE DEPARTMENT OF CHEMISTRY COLLEGE OF EDUCATION OMDURMAN ISLAMIC UNIVERSITY

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Abstract:

The study aimed to reveal the effectiveness of using mobile phone applications in virtual laboratories on academic achievement in chemistry for students of the Department of Chemistry, In Faculty of Education, University of Omdurman Islamic. To achieve this, the study followed the semi-experimental and descriptive approaches, and the research community consisted of third-level students in the Department of Chemistry, Faculty of Education, Omdurman Islamic University and members of the teaching staff in the faculties of education at Omdurman Islamic University, the University of Khartoum and the Open University of Sudan, a sample of 40 third-level students representing 50% of the original population was randomly selected, and they were divided into two equal groups: an experimental group of 20 students and a control group of 20 students A sample of (15) faculty members. The researchers used the achievement test as a tool for data collection, using the appropriate methods of analysis, the data was analyzed by using the Statistical Package for Social Sciences (SPSS). The study concluded a set of results, the most important of which are: There are statistically significant differences between the mean scores of the experimental group that studied using the mobile phone in the virtual laboratories and the average scores of the control group that studied in the usual way at the levels of analysis and synthesis among the third-level students in the Department of Chemistry, Faculty of Education, Omdurman Islamic University, The results of the interview also showed that the mobile phone is effective and suitable in the educational process because of the programs it provides that support the educational process in all its aspects. Based on these results. The researchers recommended holding courses to train science teachers on the use of these programs in implementing laboratory activities in science curricula.

Keywords: *Mobile Phone, Laboraty Parameter, Academic achievement*

INTRODUCTION

The world is now characterized by successive changes that require a quality of individuals possessing many basic and necessary skills to deal with the data of this era and its challenges, but now traditional education alone is not enough to form a generation capable of keeping up with the millennial era, which is characterized by the accumulation of technological knowledge, that modern information technology has contributed to changing the nature of life and modern technology has become a requirement of the era and mobile phones are considered one of the most skilled technology in the current era for the multiple services it provides. The development in

the field of communication and information technology as well as the spread of electronic knowledge has led to the emergence of new types of education systems, among which are mobile or mobile learning systems(Mobil Learning), which is a new type of e - learning (Mubarak, 2016), where it is possible via mobile phone (mobile); which was originally designed to transmit voice - after the developments and updates it has undergone-to enter the internet, SMS also helps us to communicate and even send information between people, as well as the capabilities of media messages (MMS) to transfer images and videos via mobile devices (return, 2019).

The increase in the capabilities of high-bandwidth network infrastructure, advances in wireless technology, and the increasing popularity of mobile phones have had the greatest impact on the rapid growth in the technology of these devices in recent years, which has led to their significant spread globally, where they have entered almost every home, and are owned by every member of societies regardless of their cultural, economic, or social level (al-hawamda, 2013).Virtual laboratories have created new environments that are more effective and exciting in the process of teaching and learning, and these laboratories consist of virtual computer programs or websites that simulate scientific experiments and through which the teacher and his students reach accurate and useful results provided through a variety of experiences at the same time the disadvantages of traditional laboratory experiments are avoided by the high the learner here lives in an imaginary environment that interacts, participates and deals with it through his senses and with the help of mobile applications, and the learner has absolute freedom to make decisions on their own without this having any negative effects.(Hassan, 2011).

The International Conference on e-learning in the Arab world (2013), the fourth International Conference on e-learning and distance learning in Riyadh (2015), and the international conference at Helwan University (2018) recommended the importance of using mobile phones in education and studying the extent to which mobile applications facilitate the educational process. There are also many studies that have dealt with virtual laboratories, including a study (al-Bayati, 2006: 13), which confirmed that virtual laboratories are the main pillar in e-learning, and also science teaching in the scientific and applied field. The researchers believe that mobile phones have a high ability to spread rapidly among learners to communicate via the internet, so it is necessary to employ them in the educational process and link them to virtual labs, so this study comes to measure the effectiveness of mobile applications with virtual labs and their impact on academic achievement in Chemistry for third-level students at the Faculty of Education Omdurman Islamic University

Become the evolution of techniques and inclusive for all modern devices and their relationship to the work of instruction, where we find many of the studies the use of computers in education reverse cell phone use in simplified and located one, as in this study, we used in two dimensions by linking mobile apps with the default, where it is still a college education depends largely on the way the speech guidance in the teaching of Science in general and chemistry especially, most of the teachers of chemistry rely on traditional teaching methods that don't allow the museum to learn according to his tastes and needs and product-specific and individual differences among learners, Without their help in obtaining chemical information or new skills or transfer some information to the practical experience to interact with it, and continue to researchers to this conclusion by way of exchange of opinions and debate with the info my money, the most assured not to their direction to get the information of chemistry through the innovations of modern technology, which is maybe one of the reasons for the low level of achievement, which highlighted the need to employ the tools of e-learning and ways of using educational technologies and diverse as the students habits and thinking skills optimization in the specific context of the problem of the current study recommended the study (Mubarak, 2016) study (Ali, 2021) Study of an old engine (Msn & Eunyoung, 2018) , the study of Kim and Su (Kim & Suh, 2018) study (Lin, 2018) and in light of the foregoing can identify the research problem which was the answer of the main following question: What is the effectiveness of the use of mobile applications in the virtual on academic achievement in

chemistry among students in the Department of Chemistry, Faculty of Education, Omdurman Islamic University

RESEARCH METHODS

The researchers used a semi-experimental approach using an experimental design known as the tribal/dimensional design using a two-group system, an experimental group and a control group. The descriptive approach of Interview Questions was also used.

RESULTS AND DISCUSSION

Research community:

First: the research community is represented by the students of Omdurman Islamic University, Faculty of Education, Chemistry Department of the third level, numbering(80) students.

Second: the interview community: the study community means the total number of elements that the researchers seek to generalize the results related to the studied problem, where the total community reached (70) members of the faculty represented by three universities, namely (Faculty of Education, University of Khartoum (35) specialization of educational technology, curricula and Biochemistry, Faculty of Education, Omdurman Islamic University(25) specialization of educational technology, curricula and Biochemistry, Faculty of Education, Open University of Sudan(10) specialization of educational technology, curricula and biochemistry.

Sample research:

Accordingly, a random sample was selected from the third - level students at the Department of Chemistry at the Faculty of Education, Omdurman Islamic University for the academic year (2020/2021), numbering (40) students, who were randomly divided (according to the system of equal random numbers) into two equal groups, a control group of (20) and an experimental group of (20), which represents 50% of the total community, numbering (80) students, and the sample also consists of (15) members of the teaching staff of the faculties of Education, University of Khartoum, Omdurman Islamic University and Sudan Open University were randomly selected, which the researchers believe that it can contribute to achieving the research goals, and by virtue of its size and method of withdrawal, it is suitable for the purposes of current research, and the best able to provide information useful in solving the research problem.

Description of the sample of teaching staff

Table No. (1) frequency distribution of sample members by academic degree

The ratio%	Issue	Scientific degree
26.7%	4	Lecturer
40%	6	A.Assistant
26.7%	4	A.Participant
6.6%	1	Professor
100%	15	Total

It is clear from Table (1) and the figure above that the majority of the respondents with a degree A.As an assistant, their percentage reached(40) % of the total sample, while the percentage of A.Participant (26.7%), lecturer (26.7%) and professor(6.6%) were attributed to the total sample.

Table No. (2) frequency distribution of sample members by specialization

The ratio%	Issue	specialization
26.7%	4	Educational technology
40%	6	Chemistry
33.3%	5	Curricula and teaching methods
100%	15	Total

It is clear from Table (2) and the figure above that the majority of the respondents majored in chemistry, with 40% of the total sample, while the percentage of educational technology majors was 26.7% of the sample, while the percentage of curricula and teaching methods majors was 33.3% of the total sample.Which indicates that there are faculty members majoring in Chemistry who are more present in the faculties of education and more use of modern technologies

Table No. (3) distribution of sample members by years of experience

The ratio%	Issue	Years of experience
20%	*3*	1-5 years
33.4%	*5*	5-10 years
46.6%	*7*	10 years and over

It is clear from Table (3) and the figure above that the majority of respondents with experience of 10 years and more amounted to (46.6%) of the total sample, while the percentage of respondents from 5-10 years(33.4%) of the sample, while the percentage of respondents from 1-5 years of teaching(20%) of the total sample.This indicates that the respondents with more than 10 years of experience have the most impact on the study community.

Table No. (4) frequency distribution of sample members by University

The ratio%	Issue	University
33.3	5	Khartoum
33.3	5	Islamic Omdurman
33.3	5	Sudan open
100%	15	Total

It is clear from Table(4) above that the percentage of equal faculty members reached (33.3%)

Study tools:

The interview was used, and achievement tests were also used as a tool to measure learning outcomes according to the following steps:

First: achievement tests

Determine the goal of the test:

The aim of the pre-test in this research is to find out how equal the students of the two groups are in the level of information and previous experience on the test subjects. While the post-test aims to find out the level of achievement of the students of the sample members after its application, and the various educational activities provided by the teacher that help raise the students ' achievement competencies, measure the extent of their comprehension and understanding, and then identify their strengths and weaknesses, measure their progress level in the subject and reveal individual differences between them.

The dimensional Achievement Test:

After completing the teaching of the module, the two researchers applied the achievement test (the same as the pre-test)to measure the cognitive levels represented by: analysis and composition, in order to measure the parity of the two groups before applying the experiment and to find out the extent of significant differences between the experimental and control groups after the end of the experiment. The two researchers then developed the test instructions.

Setting the test time:

The researchers gave the students complete freedom to answer the test questions while applying it to the survey sample without being bound by a specific time, in order to identify the appropriate time for the test, which is 50 minutes .the time was calculated by recording the time it took the first student to finish answering the test vocabulary and the time it took the last student to finish the test and then calculate the arithmetic average of the times the first student finished the test after 30 minutes and the last student 50 minutes and the average was 40 minutes. After applying the pre-test to the research groups and monitoring the scores, the arithmetic averages and standard deviations of the two groups were calculated. Believe the test, The test must represent the teaching objectives, and be appropriate to the content, the student and the importance of the opinion of specialists in the test.

Virtual honesty:

The researchers presented the test in its initial form to a group of specialists in educational technology, curricula, teaching methods and chemistry in order to confirm the apparent honesty of the tool and review its paragraphs (test questions) in order to measure the validity of the test paragraphs and its suitability to measure the achievement differences between the members of the control group and the experimental group, and they also expressed their opinions regarding the modification, deletion or addition of any paragraph they deem appropriate from the paragraphs of the test.

The arbitrators considered that the test measures what was designed to be measured and is appropriate in terms of linguistic and pedagogical formulation, and that the test chosen by the researchers to measure achievement differences is appropriate. With some amendments, whether in the wording or deletion of some phrases or the addition of other phrases, they provided some opinions and amendments that the researchers benefited from in the reformulation of some phrases

Honesty and internal connection:

Honesty and internal correlation were measured by finding the correlation coefficient, using the Pearson correlation equation :

N-MJ - s-R-MJ-s-MJ-R-

T =) n (mjs2) - (mjs2)2) (n (mjs2) - (mjs2)2)

Where

T = correlation coefficient.

N = number of respondents.

X = degrees of the experimental group .

P = represents the even terms of the test.

X - = the arithmetic mean of (X).

R - =the arithmetic mean of (R).

NX = standard deviation of (X)

P R= standard deviation of (R)

By substituting in the equation the correlation coefficient reached = 89.0

Test stability:

To calculate the stability coefficient, the Spearman-Brown equation was used.

Where T= 2R, where the test stability is = 9.0

1+R

It is a high stability coefficient, statistically significant and confirms the validity of using the test in the study.

Second: application of research tools for the interview:

The two researchers presented the interview questions to the experienced and specialists to start their opinions by amending, deleting or adding, where the researcher summarized the opinions of specialists in the following table (5) :

Questions before arbitration

Questions after the arbitration

What is the future plan for the spread of the mobile experience in distance education under e-government. What do you think is the possibility of spreading the mobile phone experience in distance education in light of the accelerated development in the field of electronic technologies. Through your specialization, put solutions in the rooting of this experience. Based on your experience and specialization in the field in question, How can you root for the experience of using a mobile phone in distance education. What are the obstacles that prevent the use of mobile phones in education at Sudanese universities. What are the obstacles that prevent the use of mobile phones in education at Sudanese universities, especially in the field of distance education. What is the positive impact of using a mobile phone in education instead of a computer. Identify the positive aspects that the use of a mobile phone can entail in education at Sudanese universities instead of a computer

Preparation and design of educational software in the unit of chemistry (carbohydrides):

The design process is the process of installing and forming parts and sub-components, so that they lead to achieving the goals of the program or system, and therefore the process of designing the experiment requires all procedures to create and form software, which is designed to perform specific and intended functions.

The software has gone through several stages, namely:

Analysis stage:

At this stage, the design requirements for the software were compiled and processed from scientific materials, activities, images, sounds, and video footage, revised, reproduced, and placed in the appropriate image for the production requirements.on it, the full conception of the software topic was developed, including the outlines of what the software should contain, goals, activities, trainings, and scientific material. the scientific material has also undergone a full analysis so that it can be presented in a way that achieves the desired goals.

Design stage:

This is the stage in which a complete visualization of the software is developed in terms of its objectives, scientific material, activities, trainings, examples and evaluation, and also outlines the general objectives of the software, a scientific material, or a general map showing the relationships of the units with each other and the content of each unit. The design stage includes the following: first, Designing the display interface with its design, visual elements, balance in the installation process and developing a software structure. Second, Designing menus, information and slides that illustrate the contents of multimedia software. Third, Put the content in a convenient design. Forth, Determine the final form of educational software, including educational alternative. Fifth, Use programs and tools to create images, movements, films, illustrations, audio texts and connect them artistically with the rest of the elements to achieve the desired goals.

Explanation of the design phase of the software used in the current study:

First: the division of the material

The material (carbohydrates) was divided into three large molecules, the first clarifies the concept of carbohydrates and their importance, the second clarifies the types of sugars and examples thereof, the third is a virtual laboratory that demonstrates the experiment of detecting monosaccharides.

A variety and succession of buttons to ensure student interaction and increase his focus on the explanations provided, in addition to the images used to strengthen and consolidate the explanations.

The first part explains the concept and definition of carbohydrates, their importance.

The second part explains the three types of sugars, briefly explains each type, and then explains two examples of each type of sugars, explaining their structural structure and chemical formulas.

The third part represents the virtual laboratory environment in which the experiments are conducted, and the mono-sugar detection experiment is being performed.

Arbitration and experimentation phase:

At this stage, the software was presented to a number of arbitrators from educational experts and specialists in Computer Science, After The Specialists reviewed

the software and expressed their opinions on it, the opinions of the arbitrators were taken into account and the software was produced in its final form based on these opinions.
Application stage:
After completing the preparation of the software in its final form, the two researchers took several steps to implement the software. Teaching students at one time, one of the researchers taught, the other supervised, along with some professors.
Presentation, discussion, analysis and interpretation of results
First: the pre-and post-test
Presentation and discussion of the result of the first imposition. To verify the first assumption, which reads:"There are no statistically significant differences between the scoring averages of the experimental group studied using a mobile phone in the virtual laboratories and the scoring averages of the control group studied in the usual way in the pre-test". The "T" test was used for two independent samples and Table No. 1 shows the result of this:

Table No. (6) shows the result of the "T" test for two independent samples to compare the average scores of students of the control and experimental groups in the pre-test:

Conclusion	The Pearson connection	Semantics	Value (V) t	Standard deviation	Average	
Is a function and there is no correlation	-0.121	0.03	42.3	2.613	24.75	Analysis
Is a function and there is no correlation	-0.145	0.34	46.9	2.603	24.76	Composition
Is a function and there is no correlation	-0.131	0.18	44.6	2.608	24.75	Collection

From Table (7) is clear that there are significant differences between the two groups where the average in the experimental group (24.750) deviation standard (2.613) and the average in the control group (19.250) deviation standard (1.834), the degree of freedom (19) for each group evinced a(0.000) is less than 5%, In favor of the experimental group, and this shows that the use of the mobile phone is not effective in teaching chemistry using the default when loading level, and increases the use of the mobile phone of the motivation of the students towards science and relevance to the circumstances of the special account, as on the virtual characterized by repeating all stages of the experiment for several times until you send in and the student indicating the importance of the use of virtual in the teaching of Science in general and chemistry in particular, and that the findings of many studies and research that compare between the teaching of Science in ways traditional education through the virtual and the result of the study with the results of her study (Metwally, 2019 World) and (Mohammed, 2016) and (gesture, 2016), which indicated the superiority of the experimental group came studied using a mobile phone and the default for the control group that studied in the usual way, in the post test, but it differed with the study (fellows et al., 2017), which made it clear that the mobile phone have negative results in the educational process, which causes a low level of collection, or study (Mira me, 2015) Agreed that the default effective and reduces the time and effort, but it differed in that the default doesn't affect the academic achievement of any that there is no difference between the traditional Virtual Institute

Presentation and discussion of the result of the third imposition

To verify the third assumption, which reads: "There are statistically significant differences between the average scores of the experimental group studied using a mobile phone in virtual laboratories and the average scores of the control group studied in the usual way at the ,composition level of third-level students at the Department of Chemistry, Faculty of Education Omdurman Islamic University.". The "T" test was used for two independent samples and Table No. (3) shows the result of this:

Table No. (8) shows the result of the "T" test for two independent samples to compare the average scores of students of the control and experimental groups in the dimensional test at the composition level

Conclusion	Semantics	Value (V) t	Degree of freedom (df)	Standard deviation	Average	Collections
There is a function	0.000	40.818	19	2.457	22.450	Empiricism
	0,000	30.931	19	2.580	17.850	The officer

From Table No. (8) above, it is clear that there are significant differences between the two groups, where the average in the experimental group was (22.450) with a standard deviation of (2.457) and the average in the control group was (17.850)with a standard deviation of(2.580), with a degree of freedom of(19) for each group with a value of (0.000), which is less than 5%, in favor of the experimental group, and this indicates that the use of a mobile phone has an effectiveness in teaching chemistry using virtual laboratories at the results of the hypothesis agreed with the results of a study (Rawda Al-Mamari, Yahya Al-Shahri, Hilal Al-kabti, 2018), a study (Hussein, 2017), a study (Mutuli, 2019), a study (Abdullah, 2016) and a study (al-Badri, 2016), which indicated the effectiveness of using mobile phone and virtual laboratories.

To verify the fourth assumption, which reads: "There are statistically significant differences in the overall academic achievement of chemistry using a mobile phone (mobile or mobile) in the applications of virtual laboratories among third-level students at the Department of Chemistry at the Faculty of Education, Omdurman Islamic University". The "T" test was used for two independent samples and Table No. (4) shows the result of this:

Table No. (9) shows the result of the "T" test for two independent samples to compare the average scores of students of the control and experimental groups in the dimensional test

Conclusion	Semantics	Value (V) t	Degree of freedom (df)	Standard deviation	Average	Collections
There is a function	0.000	41.231	19	1.626	23.61	Empiricism
	0.000	44.123	19	0.990	18.55	The officer

From Table No. (4) above, it is clear that there are significant statistical differences between the two groups, where the average in the experimental (23.61) with a standard deviation (1.626) and the average in the control group (18.55) with a standard deviation

(0.990), with a degree of freedom(19) for each group with a value (0.000), which is less than 5%, in favor of the experimental group, and this indicates that the use of mobile phone in the applications of virtual laboratories has an effectiveness in increasing academic achievement. The results of the hypothesis agreed with the results of a study (Al-Mamari et al., 2018), a study (Hussein, 2017), (Metwally, 2019), a study (Mohammed, 2016) and a study (al-Badri, 2016), which indicated the superiority of the experimental group studied using a mobile phone and virtual laboratories in academic achievement over the control group studied in the usual way in the dimensional test

The results of this hypothesis differed with a study (Zamali, 2017), which showed that using a mobile phone has negative consequences on academic achievement during the business class, which causes a decrease in achievement.

Table(10) shows the Pearson correlation coefficient for the results of ee dimensional testth

Academic achievement		Installation level		Level of analysis		Collections
The officer	Empiricism	The officer	Empiricism	The officer	Empiricism	
0.765		0.782		0.510		Link value
0.000		0.000		0.000		Semantics

From the above table it is clear that there is an correlation in the scores of the dimensional test at the level of 5%.

Second: discussion of Interview Questions

First question: What do you think is the possibility of spreading the mobile phone experience in distance education in light of the accelerated development in the field of electronic technologies

To answer the above question, see the following table ;

Table (11): the point of view of the respondents

The ratio	Redundancy	
93%	14	Points of agreement
6.6%	1	Differences
100%	15	Total

From the controversy(11), it is clear that:the agreement of the respondents ' answers reached (93.4%) that the mobile phone has become one of the most widespread modern technical means in the current era that is easy to use in education for its ease of carrying, and differed by(6.6%), where this difference is unique to Dr.(Dr.M) by saying that it is difficult to spread the mobile phone experience in distance education due to the lack of communication networks in some areas, especially the internet service.

The second question: What is the reality of your experience and your specialization in the field in question How can you root for the experience of using a mobile phone in distance education

To answer the above question, see the following table

;

le (12): the point of view of the respondentsTab

The ratio	Redundancy	
93.4%	14	Points of agreement
6.6%	1	Differences
100%	15	Total

From Table (12) it is clear that: the respondents ' answers(93.4%)agree that it is very easy to deliver information in their specialties through the applications provided by mobile phones to serve the educational process through training on the use of mobile phone capabilities in the specialty in question, where the percentage of difference(6.6%)is unique to this difference.M) by saying that it is very difficult to communicate information through the phone in the disciplines of Science in general and chemistry in particular due to the lack of all senses.

The third question: What are the obstacles that prevent the use of mobile phones in education at Sudanese universities, especially in the field of distance education

To answer the above question, see the following table:

Table (13): the point of view of the respondents

The ratio	Redundancy	
93.4%	14	Points of agreement
6.6%	1	Differences
100%	15	Total

From Table (13) it is clear that: 93.4% of the examiners ' answers agree that the infrastructure of universities is not equipped to use mobile phones in distance education, the lack of communication networks, the lack of production of educational programs, most of the devices used by students are not efficient to achieve the concept of distance education, the high prices of smart phones, and we do not provide the necessary experience in dealing with mobile phones, and the percentage of difference (6.6%) is unique to Dr.K) by saying that there are no obstacles, mentioning only the difficulty of connecting networks to the communication network.

Fourth question: identify the positive aspects that the use of a mobile phone can entail in education at Sudanese universities instead of a computer

To answer the above question, see the following table:

Table (14): the point of view of the respondents

The ratio	Redundancy	
100%	15	Points of agreement
100%	15	Total

All the respondents agreed that the phones are lightweight and have a high storage capacity , and information can be saved and retrieved at any time and easily traded, providing education at any time if there is a need for it

Comparison of the results of the dimensional test with the results of the interview questions:

The results of the post-test proved that the use of a mobile phone has a high effectiveness in the educational process and improving the level of academic achievement, as the results of the hypotheses were in favor of the group on which the software was applied, that is, the phone is suitable for teaching science, and this was confirmed by the results of the interview questions, which showed that the mobile phone has become one of the most modern technical means widespread in the current era that is easy to use in education for ease of carrying, that it is very easy to deliver information in various disciplines through the applications provided by mobile phones to serve the

educational process through training on using the mobile phone capabilities in the specialty in question, high storage capacity, and information can be saved and retrieved at any time and easily traded, providing education at any time if needed.

Despite this agreement in the results of the remote test and the interview questions, there are some minor differences from the point of view of the individuals of the interview sample by saying that it is difficult to spread the mobile phone experience in distance education due to the lack of communication networks in some areas, especially the internet service, that it is very difficult to deliver information through the phone in the disciplines of Science in general and chemistry in particular due to the lack of all senses.

CONCLUSIONS AND RECOMMENDATIONS

The use of virtual laboratory programs with exact disciplines in chemistry, especially dangerous or for which there are no devices and materials available for their application. Encouraging science teachers to master the use of virtual laboratories and linking them to the mobile phone, and the necessary techniques to benefit from technological innovations. Holding courses to train science teachers on the use of these programs in the implementation of laboratory activities in the science curriculum. The use of virtual laboratory applications in the Android system in the teaching of Biochemistry due to the proof of its effectiveness in this study.

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