Integrated Development in Learning English And Science at an Early Age Using Simple Hands-On Activities in Live Situations

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Introduction:

English is a rich and international medium of communication. It is essential in research and economy. The researcher shows the importance of teaching English at an early age. She tries to explore the possibility of learning some scientific terms in English in live situations and explores whether they can conceive them.

The strategy is based on " hands-on" activities. This is an American recognized method in science learning. A French project experimented teaching both French language and science in Egypt; they used this American strategy which they called “le main dans le pate".

The integrated approach in teaching can be highly motivating to learners of all ages and backgrounds. This approach stresses that English becomes a real mean of interaction and sharing among people. This approach allows teacher to evaluate the learner's progress in multiple skills at the same time.

The Problem of Study:

The researcher tries to answer the following question:

What is the effectiveness of a program based on" Hands – On" activities on development of English and Science?

Two sub-questions are derived from the previous question:

1.What is the effectiveness of a program based on "Hands- on" in live situations on conceiving scientific concepts?

2.What is the effectiveness of a program based on "Hands-On" activities in live situations on acquiring of English terms?

The Study Limitations:

1. **Human**: The sample is 30 pre-school children whose age from 5 to 6 years; they are divided into the experimental group and control group.
2. **Program:** Some scientific terms and words in English are presented to children in live situations like: in the garden, in the laboratory, in the house affairs room of the school. Children perform the experiments and activities by him/her self. Through these activities and experiments they learn English terms and words. The program contains the units: water terms (plain water- hot water- cold water), human body terms (I can eat- I can breathe- my body grows), plants term (root is down), insect word (spider), machines words and term (blender- cooker- iron- machines help us), heat word (heat), weather terms (winter is cold- summer is hot).
3. **Place:** The program is applied in a kindergarten in Quessna, El- Menoufia.

The Study Tools:

1. 'A pre/post-test' to compare development of the experimental and control groups in different aspects.
2. 'An observation form' to evaluate two things; conceiving the scientific concepts in the activities and acquisition of the English terms and words.

Definition of Terms:

1. **Integration:** refers not to content areas, but rather to recognizing the natural relationship of the four language skills. Accordingly, we may understand integration as two adjacent, linked teaching arts themselves, then the further inclusion of other content areas within the already integrated language curriculum. **(N.Ritter, 1999)**

2. Hands – on Activities: These are defined as simple materials, kits, samples that can be used or observe during learning inside the classroom.

3. Situations: The settings in which the linguistic element occurs. Situations involve the people, events; and things thus the situation gives the context its social meaning. **(Soraya A El- Hadad, 1984:22)**

4. CBI: Content Based Instruction. CBI refers to integration language learning and content learning. This is achieved by shifting the focus of instruction from learning of language to learning of language through the study of subject matter. **(S. Stryker & B.Leaver, 1997)**

Theoretical Background and Review of Literature

First: Importance of Presenting Foreign Language at an Early Age

1. It has a positive effect on intellectual growth.
2. It enriches and enhances the child's mental development.
3. It leaves children with more flexibility in thinking, greater sensitivity to language, and a better ear for listening.
4. It improves the child's understanding of his/her native language.
5. It increases job opportunities in many careers where knowing another language is a real assistant .
6. It gives the child the ability to communicate with others.
7. It opens the doors to other cultures and helps children understand people from other countries. (http://www.Cal.or/earlylang./benbi-htm)

- **Brain Keys and Suitable Age for Presenting Foreign Languages.**

Studies on early brain development continue to show new insights about the brain. Now, we know that brain development starts during pregnancy. By age three, the weight of child's brain triples from 370 grams to 1080 grams. The brain in born with 100 billion neurons and they will never grow any more.

Most synapses are created after birth as a results of stimuli coming from the environment such as, smelling mothers' skin, tasting mother's milk. Even before a baby is born, he is being exposed to learning language this explains why the borns preferring their mother's voices than their father's voices **(Language and Brain, 2002).**

Recent brain research has provided that there are "windows of opportunity" or " critical periods " in the child's life when the brain is biologically best equipped to learn language, then will no longer be available for language learning; after this period, the capacity of language learning is lost. **(Ritchie &Bhatia, 1996: 164-184)**.

There is a study that states that between the ages of 4 to 12 an enormous amount of brain restructuring takes place. Depending on a child's experiences, the brain is deciding whether to keep or delete connections. If the child is receiving sensory stimulation, learning takes place **(Beth Fleming, 2002)**.

Studies have shown that Children who learn a foreign language before adolescence are much more likely to have native-like pronunciation. A number of experts dues this proficiency to physiological changes that occur in the brain maturing. Introducing children to alternative ways of expressing themselves and to different cultures gives them the opportunity to communicate **(Marcos Cathleen, 2002)**.

Comparisons of bilingual and monolingual children indicate that bilingualism can lead to superior performance on a variety of intellectual skills.

These can range from performance on tests of analysis of abstract visual patterns to measures of "metalinguistic awareness" **(Hakuta, 2005)**.

Comment: This study agrees with the following studies in importance of presenting a foreign language at early age.

1- R. I. Mayberry & E. Lock (2003): The results were:

- The learners, who learned at early age, had high performance as the native speakers in grammatical rules.
- The learners who learned grammatical rules at later age, had low performance.

2- A. Scherog, et al., (2004): The results were that The native speakers of English who learned German after childhood, score low level in grammatical aspects. In contrast, they are similar to the native speakers in vocabularies.

3- Anne K. Soderman& Oshio Toko (2009): The results were that the girls had a difficulty in social interaction. While the skills in English increased, the difficulty of social interaction decreased.

4- Camarena & Mario (2009): The result was that an academic progress of the bilingual children.

5- Jacqueline & Johnson (2009): The results were that There is a negative relation between the age of coming to USA and the performance on the written test; persons Who came to USA at an early age, their performance was higher on the written test.

- **Appropriate Methodology for Young Children:**

1. Total Physical Response Approach (TPR)

This approach that developed by(Asher) is based on:

a. Comprehension precedes production.

b. Comprehension can be performed by bodily movements.

c. Delaying speech production facilitates learning by reducing anxiety.

2. **Communicative Approach.**

Short (1991) states that students who have opportunities to discuss materials that provide motivation to learn and participate in class. They can use the language through realistic situation or dialogues. They can play roles in conversations. This approach is available to adult and young.

3. **The Natural Approach**: This approach is based on:

a. Silent period that normally precedes language production results in vocabulary development in the acquisition of new structures.

b. Teachers should attend to meaning rather than grammar.

c. Reading is important.

d. Writing should be practiced for functional goals **(Short, ibid.)**

<u>Second:</u> Importance of Science for Young Children.

Developing science understanding and scientific attitude must begin early in one's life. To make science meaningful to young child, it needs to be integrated into the curriculum. Because young children has active curiosity in learning science, they enjoy it. They build positive science attitudes and develop confidence in themselves **(Arthur A. Carin, 1993, Guided Discovery:127)**.

Through experimentation young children can explore the properties of water, heat , and so on. The early childhood years are basic times to begin their work in science. Science makes citizens make decisions about the problems facing them. Science study is essential to people's physical and mental health. **(Cliatt & Shaw, 1992: 9)**.

Science strengthens children's intellectual growth such as predicting, classifying, and ordering. They are stimulated to build communication. It enhances physical growth of children. Working together supports emotional feelings and motor skills. It makes them build social skills through attitudes. **(Cliat & Shaw, 1992, p.3) (Carin, Teaching Modern Science, 1993:30).**

<u>Third:</u> The Integration in English and Science

The integration of particular content with language teaching aims is known as Content –Based Instruction. The focus is acquiring information through a foreign language, in the process, and developing their academic language skills. CBI is based on the assumption that language can be effectively taught through the medium of subject matter content.

CBI can be methodological system, a framework for an entire program of instruction. Thus it implies the total integration of language learning and content learning. **(Kabesh, 2002:7)**.

Integrated English(IE) stresses taking English as a communication tool, and integrating the target language with content and culture. It integrates English learning with subject learning. IE advocates teaching contents in English to enrich or reinforce instruction in the learner's native language, but not substituting for it. In fact, the responsibility for content learning also lies with other content subject teachers. Topics and tasks for language practice may be drawn from many disciplines in a single lesson or unit. IE belongs to theme based courses, which are language-driven: the goal of these courses is to help learners develop English skills and proficiency and cross-cultural understanding as well. Themes are selected based on their potential to contribute to the learner's language growth in specific topical or functional domains. What is taught in English classes is not only the language itself. It includes all kinds of knowledge, such as knowledge of language, math, geography, history, literary, civic virtues, music, art, science, society, culture, and etc.

(Jianfang Xiao, 2016)

The recent researches show that when science is integrated with other subjects, both science and the other subjects are learned more effectively. Also, integration of science with other disciplines improves both the quality and quantity of science instruction and learning. Students understand and remember

better when they listen, talk, read write , and "do" what they are learning. This way reinforces their language learning. **(Cliat & Shaw, Op. C it: 235)**.

Comment: This study agrees with the following studies in the importance of integration between language and other subjects:

1- **G. Chien (2003):** The results showed that the students were highly motivated after studying the integrated content – based EFL course.

2- Pamela & Spycher (2009): The results showed that the experimental group learned many English words than the control

group. This study is a major support of the recent study because it is similar to it.

Fourth: Using Hands – on Activities in Live Situations to integrate English and Science:

" Children must master the language of things before they master the language of words (Froebel) .

In this sentence, Froebel expresses the essence of early childhood education. He clarifies that children don't know red and green, sweet and sour, rough and smooth, cold and hot or any of the other physical sensations without tasting , touching or feeling something. They can only be learned by direct interaction with things. (www.educationnet.or/unabridged /2012elkind:html)

The real-world application enhances the meaningfulness of learning **(Erlandson & McVittie, 2001:28-36).** Such student-centered, cognitively engaging activities are rare in traditional classrooms, yet they are at the heart of integration **(Applebee et al., 2007: 1002-1039).**

The activities' methods are successful in teaching for children because if children practice the activities which they study, they will learn them very well. At this age, pupil will be quite happy to colour little drawings in his/her exercise book, to play counting games, to act out a scene at the classroom shop or to watch the performance of a glove puppet. Songs, games and drama are familiar

parts of his /her school experience, and all these activities can be used in the language lessons **(David H. Harding, 1967: 45)**.

The National Science Teachers Association expressed the necessity of laboratory experiences for teaching and learning science. The hands- on activities emphasize the science skills of observing, measuring, recording, classifying, interpreting data, inferring, predicting, investigating, and making models.

Elementary and middle school students are in a formative stage of mental development, which requires actions on objects for the development of reasoning. We should supply, during these vital growth years, a variety of minds-on / hands – on activities in which students manipulate objects to see relationships and draw conclusions. **(Carin , Guided Discovery, op. cit: 98)**.

(Soraya A. El Hadad, 1984: 22) in discussing teaching English in situational dialogue says" It's generally believed that if children are taught how to use language for communication, they will be motivated to greater achievement in learning. Also, they will develop positive attitudes toward language. The scientific concepts should be taught in communicative way not as structural sentences in isolation from each other. The situational dialogue motivates learners to learn and develops positive attitudes toward language learning**.**

Comment: This study agrees with the following studies in importance of hands-on activities in live situations.

1- Mathew, Lynn., Mc Donnell (1993): The results are:

- The teachers of science need a lot of practical science and hands- on objects.
- The practical activity represents ⅓ of learning time which is based on book in south Dakota.

2. Amani – El-Bassat (1998): The results are:

- Hand –on methods is the best method to teach the scientific concepts.

- Hands – on method related the physical manual, art and intellectual activities hence the functional knowledge of the child.

Statistical Analysis of Findings

The researcher tried to answer the main question " ***How far will the proposed program that is based on hands- on activities in live situations be effective in developing English and science at an early age?"***

The researcher used the following statistical analysis for testing the hypotheses :

1- (Wilcoxon) test for related samples.

2- (Mann-Whitney) U Test for independent samples.

1- The First Hypothesis:

There are statistically significant differences at 0.01 level between the control and experimental group mean ranks in the post test of conceiving the conception and acquisition of the terms in favor of the experimental group.

Table (1)

Test	Group	N	Mean Ranks	Sum ranks	Mann-Whitney	Z	Sign
Conceiving Concepts	Experimental	15	22.9	344.0	1.00	4.748	Sig.at 0.01
	Control	15	8.07	121.0			
Acquisition of terms	Experimental	15	23.00	345.0	0.00	4.689	Sig.at 0.01
	Control	15	8.00	120.0			

Table showed that children of the experimental group conceived the presented concepts and acquired the English terms better than the control group children. **We can deduce that**: the presented program was effective. Hands – on activities in lives situations make children excited and they acquire English terms easily.

2- The Second Hypothesis :

There are statistically significant differences at 0.01 levels between the control and experimental groups mean rank scores in the post test of conceiving the scientific concepts and acquisition of the terms in all subjects of program in favor of the experimental group.

Table (2)

Test	Group	N	Mean Ranks	Sum ranks	Mann-Whitney	Z	Sign
Conceiving Water Concepts	Experimental	15	21	315	30	3.98	Sig.at 0.01
	Control	15	10	150			
Acquisition of water terms	Experimental	15	22.93	344	1	4.77	Sig.at 0.01
	Control	15	8.07	121			
Conceiving Human body concepts	Experimental	15	22.5	337.5	7.5	4.78	Sig.at 0.01
	Control	15	8.5	127.5			
Acquisition of human body terms	Experimental	15	22.8	342	3	4.65	Sig.at 0.01
	Control	15	8.2	123			
Conceiving plants concepts	Experimental	15	20.8	312	33	3.79	Sig.at 0.01
	Control	15	10.2	153			
Acquisition of plants concepts	Experimental	15	22.1	331.5	13.5	4.42	Sig.at 0.01
	Control	15	8.9	133.5			
Conceiving animals concepts	Experimental	15	22.5	337.5	7.5	4.92	Sig.at 0.01
	Control	15	8.5	127.5			
Acquisition of animals terms	Experimental	15	20.4	306	39	3.46	Sig.at 0.01
	Control	15	10.6	159			
Conceiving Machines concepts	Experimental	15	18.5	277.5	67.5	2.69	Sig.at 0.01
	Control	15	12.5	187.5			
Acquisition of Machines	Experimental	15	22	330	15	4.17	Sig.at 0.01
	Control	15	9	135			
Conceiving Heat Concepts	Experimental	15	21.5	322.5	22.5	4.4	Sig.at 0.01
	Control	15	9	135			
Acquisition of Heat terms	Experimental	15	21.5	322.5	22.5	4.32	Sig.at 0.01
	Control	15	9.5	142.5			
Conceiving Weather Concepts	Experimental	15	20.17	302.5	42.5	3.1	Sig.at 0.01
	Control	15	10.83	327.5			
Acquisition of Weather terms	Experimental	15	21.83	327.5	17.5	4.9	Sig.at 0.01
	Control	15	9.17	137.5			

The (Mann Whitney) results showed that the performance of the experimental group in conceiving the concepts and acquisition of terms is higher than the control group in the sub points of the post achievement test.

We can deduce that : Depending on the hands – on activities in live situations is effective because children deal with every thing manually.

3. The Third Hypothesis.

There are statistically significant differences at 0.01 level between the control and experimental groups in mean rank scores in the observation form of conceiving the scientific concepts and acquisition of the terms in favor of the experimental group.

Table (3)

Test	Group	N	Mean Ranks	Sum ranks	Mann-Whitney	Z	Sign
Conceiving Concepts	Experimental	15	22.93	344	1	4.72	Sig.at 0.01
	Control	15	8.07	121			
Acquisition of terms	Experimental	15	23	345	0	4.68	Sig.at 0.01
	Control	15	8	120			

The (Mann Whitney) results showed that the hypothesis is achieved. The observation form of a acquisition of terms and conceiving scientific concepts are much higher in the exp. group than the con. group. This can be interpreted by the high performance during activities that makes them more efficient in acquisition English terms.

4. The Fourth Hypothesis:

There are statistically significant differences at 0.01 level between the control and experimental groups mean rank scores in the observation form of conceiving the scientific concepts and acquisition of terms of all the program subjects in favor of the experiment group.

Table (4)

Test	Group	N	Mean Ranks	Sum ranks	Mann-Whitney	Z	Sign
Conceiving Water Concepts	Experimental	15	20.5	307.5	30	3.98	Sig.at 0.01
	Control	15	10.5	157.5			
Acquisition of water terms	Experimental	15	22.9	343.5	1	4.77	Sig.at 0.01
	Control	15	8.1	121.5			
Conceiving Human body concepts	Experimental	15	21.5	322.5	7.5	4.78	Sig.at 0.01
	Control	15	9.5	142.9			
Acquisition of human body terms	Experimental	15	22.93	344	3	4.65	Sig.at 0.01
	Control	15	8.067	121			
Conceiving plants concepts	Experimental	15	20.73	311	33	3.79	Sig.at 0.01
	Control	15	10.27	154			
Acquisition of plants concepts	Experimental	15	22.23	333.5	13.5	4.42	Sig.at 0.01
	Control	15	8.77	131.5			
Conceiving animals concepts	Experimental	15	22.5	337.5	7.5	4.92	Sig.at 0.01
	Control	15	8.5	127.5			
Acquisition of animals terms	Experimental	15	20.83	312.5	39	3.46	Sig.at 0.01
	Control	15	10.17	152.9			
Conceiving Machines concepts	Experimental	15	18.5	227.5	67.5	2.69	Sig.at 0.01
	Control	15	12.5	187.5			
Acquisition of Machines	Experimental	15	22.13	332	15	4.17	Sig.at 0.01
	Control	15	8.87	133			
Conceiving Heat Concepts	Experimental	15	21.5	322.5	22.5	4.4	Sig.at 0.01
	Control	15	9.5	142.5			
Acquisition of Heat terms	Experimental	15	21.5	322.5	22.5	4.32	Sig.at 0.01
	Control	15	9.5	142.5			
Conceiving Weather Concepts	Experimental	15	20.17	302.5	42.5	3.1	Sig.at 0.01
	Control	15	10.83	16.25			
Acquisition of Weather terms	Experimental	15	22.03	330.5	17.5	4.9	Sig.at 0.01
	Control	15	8.97	134.5			

The (Mann Whitney) results related to experimental and control groups in post application in sub points of the observation form showed that the results

are in favor of the exp. group in the different activities. This is because of practice the activities in live situations.

5. The Fifth Hypothesis.

There are statistically significant differences at 0.01 level between rank scores means of the experimental group in the pre/post application of test in favor of the post test.

Table (5)

The results of (Wilcoxon) related to the experimental group in applying the pre and post applications of achievement test and its sub items.

Test		N	Mean Ranks	Sum ranks	Z	Sign
Water concepts	Negative ranks	0	0	0	3.35	Sig.at 0.01
	Positive Ranks	14	7.5	105		
	Ties	1				
	Total	15				
Water terms	Negative ranks	0	0	0	3.57	Sig.at 0.01
	Positive Ranks	15	8	102		
	Ties	0				
	Total	15				
Human body concepts	Negative ranks	0	0	0	3.25	Sig.at 0.01
	Positive Ranks	13	7	91		
	Ties	2				
	Total	15				
Human body terms	Negative ranks	0	0	0	3.5	Sig.at 0.01
	Positive Ranks	15	8	120		
	Ties	0				
	Total	15				
Plants concepts	Negative ranks	0	0	0	3.69	Sig.at 0.01
	Positive Ranks	15	8	120		
	Ties	0				
	Total	15				
Plants terms	Negative ranks	0	0	0	3.63	Sig.at 0.01
	Positive Ranks	15	8	120		
	Ties	0				
	Total	15				
Animals concepts	Negative ranks	0	0	0	3.77	Sig.at 0.01
	Positive Ranks	15	8	120		

	Ties	0				
	Total	15				
Animals terms	**Negative ranks**	0	0	0	3.5	Sig.at 0.01
	Positive Ranks	13	7	91		
	Ties	2				
	Total	15				
Machines concepts	**Negative ranks**	0	0	0	3.07	Sig.at 0.01
	Positive Ranks	11	6	60		
	Ties	4				
	Total	15				
Machines terms	**Negative ranks**	0	0	0	3.49	Sig.at 0.01
	Positive Ranks	15	8	120		
	Ties	0				
	Total	15				
Heat concept	**Negative ranks**	0	0	0	3.87	Sig.at 0.01
	Positive Ranks	15	8	120		
	Ties	0				
	Total	15				
Heat term	**Negative ranks**	0	0	0	3.74	Sig.at 0.01
	Positive Ranks	14	7.5	105		
	Ties	1				
	Total	15				
Weather concepts	**Negative ranks**	0	0	0	3.48	Sig.at 0.01
	Positive Ranks	13	7	19		
	Ties	2				
	Total	15				
Weather terms	**Negative ranks**	0	0	0	3.42	Sig.at 0.01
	Positive Ranks	15	8	120		
	Ties	0				
	Total	15				
Concepts totally	**Negative ranks**	0	0	0	3.42	Sig.at 0.01
	Positive Ranks	15	8	120		
	Ties	0				
	Total	15				
Terms totally	**Negative ranks**	0	0	0	3.43	Sig.at 0.01
	Positive Ranks	15	8	120		
	Ties	0				
	Total	15				

The hypothesis was achieved. The researcher concludes that the differences are significant at 0.01 level in the sub points of the test; hence the

proposed program is effective in all its points and the children acquired the required terms. This is because of practicing every activity by themselves. The live situations make them never forget what they learn. This means that the children's performance after learning the program is better than it was before activities in the test.

Table (6)

The results of (Wilcoxon) related to the control group in the pre and post applications of the achievement test and its sub-points.

Test		N	Mean Ranks	Sum ranks	Z	Sign
Water concepts	Negative ranks	0	0	0	-1.63	Not sign
	Positive Ranks	3	2	6		
	Ties	12				
	Total	15				
Water terms	Negative ranks	0	0	0	-3.11	Sig. at 0.01
	Positive Ranks	12	6.5	78		
	Ties	3				
	Total	15				
Human body concepts	Negative ranks	1	6	6	-1.71	Not sign
	Positive Ranks	7	4.285	30		
	Ties	7				
	Total	15				
Human body terms	Negative ranks	0	0	0	-2.54	Sig. at 0.01
	Positive Ranks	8	4.5	36		
	Ties	7				
	Total	15				
Plants concepts	Negative ranks	0	0	0	-2.27	Sig. at 0.01
	Positive Ranks	6	3.5	21		
	Ties	9				
	Total	15				
Plants terms	Negative ranks	0	0	0	-1.89	Not sign
	Positive Ranks	4	2.5	10		
	Ties	11				
	Total	15				
Animals concepts	Negative ranks	0	0	0	-1.73	Not Sign
	Positive Ranks	3	2	6		
	Ties	12				

	Total	15				
Animals terms	**Negative ranks**	0	0	0	-1.73	Not Sign
	Positive Ranks	3	2	6		
	Ties	12				
	Total	15				
Machines concepts	**Negative ranks**	0	0	0	-1.73	Not Sign
	Positive Ranks	3	2	6		
	Ties	12				
	Total	15				
Machines terms	**Negative ranks**	0	0	0	-2.81	Sig.at 0.01
	Positive Ranks	9	5	45		
	Ties	6				
	Total	15				
Heat concept	**Negative ranks**	0	0	0	-1.73	Not Sign
	Positive Ranks	3	2	6		
	Ties	12				
	Total	15				
Heat term	**Negative ranks**	0	0	0	-1.41	Not Sign
	Positive Ranks	2	1.5	3		
	Ties	1				
	Total	15				
Weather concepts	**Negative ranks**	2	2.9	5	-0.68	Not Sign
	Positive Ranks	3	3.333	10		
	Ties	10				
	Total	15				
Weather terms	**Negative ranks**	0	0	0	-2.06	Sig.at 0.01
	Positive Ranks	5	3	15		
	Ties	10				
	Total	15				
Concepts totally	**Negative ranks**	1	1	1	-3.13	Sig.at 0.01
	Positive Ranks	12	7.5	90		
	Ties	2				
	Total	15				
Terms totally	**Negative ranks**	0	0	0	-3.42	Sig.at 0.01
	Positive Ranks	15	8	120		
	Ties	0				
	Total	15				

The results of the control group are significant at 0.01 level in some points and aren't significant in other points. This is because of the presented traditional program they learned which depends on repetition and memorization.

Recommendations :

1. The KG teachers should present science for children in real environments such as garden, laboratory, and the zoo.
2. The children should learn the foreign language in communicative method.
3. The KG teachers should present everything in practical method.

Suggestions for Further Researches:

1. Investigating the reasons that make parents encourage their children to learn foreign languages.
2. Investigating the effectiveness of an integrated course of English and Math on acquisition of English and Math at early age.

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