الفصل الثالث

The Effects of Writing - to - Learn Strategy on The Mathematics Achievement of Preparatory Stage Pupils in Egypt(*)

(*) تم عرض هذا البحث فى المؤتمر الدولى التالى:
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Introduction:

The traditional view has been said that students learn to write in English classes and to compute in mathematics classes. Recent trends in curriculum and instruction have stressed developmental and cognitive issues. One such trend is called "writing - to - learn" or "writing - across - the curriculum". The use of the writing - to - learn strategy in mathematics classes is one way; teachers can implement "Mathematics as Communication " the second standard in NCTM's (1989:78) Curriculum and Evaluation Standards for School's Mathematics. The use of writing in mathematics is receiving increased attention as an instructional tool for teachers and as learning aid for students.

Theoretical Background:

"Writing - to - learn" strategy or "writing across the curriculum" has been emphasized in the literature since the early 1980's (Johnson and Holcombeg , 1993). This strategy is based on the view that the process of writing about a subject leads to increase understanding and develops the capacity to use the language of these fields fluently.

To throw light on this strategy, the following points should be known:

I. The Different Kinds of Writing Activities:

There are many kinds of writing activities which can be used in the " writing - to - learn " strategy such as:

K- W- L activity:

K-W-L is an abbreviation of what students: **K**now - **W**ant to know - **L**earn . To use this activity, place three columns labeled K, W, L on a sheet of paper. At the start of the unit the teacher distributes the papers and asks the students to complete the first two columns. Through their responses, the teacher can determine the prior knowledge of the class and their interests. At the end of the unit, the students are asked to complete the third column to see the growth that they have made (Andrews, 1997: 141).

Write and Follow Directions:

One student builds a structure and records a set of directions (by using a large number of mathematical terms) for another student to follow its to produce the same structure (Burchfield and others, 1993).

Pair Share:

This is a very simple activity to use when the teacher feels that the student do not understand the lesson. He stops and asks them to explain what is difficult for them. After the students " Free - write " for a couple of minutes, they chare their writing with their classmates. This can help to remove their confusion (Burchfield and others, 1993).

Journal Writing:

This is a diary like a series of writing assignments. Each assignment is short and written in prose rather than in the

traditional mathematical style. The students can write in their journals: daily goals, rational for learning any concepts and the strategies used to solve problems (Bagley, 1992: 660). It can give both the teachers and the students great insight into a student's progress (Potter, 1996: 184).

Creative Writing:

Students are encouraged to write poems or stories or plays about mathematical concepts. They can be asked to write a letter to:

- Mathematicians of yore (McIntosh , 1991 : 423).
- A friend advising him how to correct his mistakes, solve his problems or explain mathematical lesson to him.

II. The Timing of Writing Activities:

There are many opinions about the best time to apply these writing activities such as:

- Elliott (1996: 92) suggested that writing activities could be an effective tool at different times in the classroom. During the first few minutes, a student can respond to a review question. Students also can summarize the day's lesson in the last few minutes of a class.
- Ryan and Rillero (1996: 78) recommended that the " writing - to - learn math program", should take only a few minutes in each period. It does not take long to answer the question usually a few minutes after the start of the period.

- Stewart and Chance (1995: 92) stated that the writing activities should occur three times a week during the last five minutes of class.
- Burchfield and Others (1993) suggested that the writing activities can be used:
  - ★ Before a lesson to help the student to activate the prior knowledge he has on the subject.
  - ★ During a lesson, when a class is learning a new idea, through writing a short paragraph describing what they understand.
  - ★ After a lesson, students are asked to reflect back on the lesson.

III. The Importance of Writing in Mathematics Classroom:

Writing in mathematics classroom is important for both the teacher and the student for these reasons:

- It is a way of stimulating dialogue between students and teachers (Miller, 1991: 516 - 521).
- It helps pupils to:
  - * Explore, clarify, confirm and extend their thinking and understanding of mathematics (Dustershoff, 1995:48 - 49).
  - * Also assists their understanding of the " why, what, and how to... " of mathematics. (Palmer, 1997: 506).
- It helps the teacher to :

*Monitor students Progress,make instructional decisions

and evaluate students' achievement (Mayer and Hillman, 1996 : 428)

* Determine the abilities of the students in:

explaining concepts, using mathematical language effectively, organizing information, using communication skills and using mathematics to make sense of a complex situation.(Burchfield and others, 1993).

Through the previous theoretical background, the researcher can:

★ Design some writing activities, including a collection of different kinds of activities, such as: creative writing, writing and following direction.

★ Determine the application time of these activities. The last five minutes in each class is used for these writing activities.

Previous Studies:

Through the survey of the recent studies, the following conclusions can be made:

● These studies were aimed to measure the effectiveness of writing activities on one or more of the following:

- Mathematical achievement (Sallee, 1997; Davis 1996; Albert 1996; Mower 1996; Pugalee 1996; Smith 1996).

- Teacher's decisions (Lollis, 1997).

- Attitude towards mathematics (Rodgers, 1997; Heath 1997; Abbey 1997; Baker 1995; Kasparek 1994).
- Mathematical communication (Senne 1996).

- Writing - to - learn strategy was applied in different stages such as:
  - Elementary stage (Thurlow, 1996).
  - Middle stage (Dipillo, 1994).
  - High school (Doctorow, 1996; Kasparek 1994).
  - College (Giovinazzo, 1997; Heath 1997; Mower 1996; Baker 1995).
- There are contrasts between the results of these studies such as:
  - Some studies proved that this strategy has an effect on mathematical achievement and attitude (Dipillo, 1994).
  - Others proved that this strategy has no effect on mathematical achievement or attitude (Rodgers, 1997).
  - Others proved that this strategy has an effect on mathematical achievement and no effect on attitude (Millican, 1994).

May be the reasons are related to the differences in the samples or in the type of writing activities which are used. It is obvious that there are no previous studies that aim to measure the effectiveness of this strategy on the

mathematical achievement of Egyptian pupils. Because of the lack of studies, there is a need to do this research.

The Problem:

The curriculum and evaluation standards for school mathematics (NCTM) emphasize the need to address communication skills. These skills, including listening, speaking, reading, and writing, enhance mathematical understanding and problem solving ability. In Egypt, the only writing activity of the pupils is solving some problems according to standardized steps. The pupils do not get an opportunity to express their mathematical suggestions or feelings in writing. But according to this strategy, there are many kinds of writing activities, which can be easily used in the mathematics classroom. This study tries to answer this major question:

What is the effectiveness of " writing - to - learn" strategy on mathematics achievement of preparatory stage pupils in Egypt?

To answer this question, the following questions should be answered:

1. What are the different kinds of writing activities which can be easily used in math class by using the " writing to learn " strategy?
2. What are the differences between the experimental and control groups in mathematical achievement?
3. What is the best way to apply this strategy (as a group or as an individual work)?

4. What are the differences between male and female pupils in mathematical achievement test?

The Hypotheses:

This study tries to satisfy the following hypotheses:

1. There are statistical, significant differences between the mean scores of experimental groups and control groups in favor of the experimental groups.
2. There are statistical, significant differences between the groups, which work collectively and the groups, which work individually in favor of the former.
3. There are statistical, significant differences between male and female pupils in favor of the male pupils.

The Procedures:

1) A theoretical study of " writing - to - learn" strategy.

2) A survey of the previous studies conducted.

3) A choice of unit from the first - grade algebra textbook in the preparatory stage.

4) Designing some writing activities.

5) Designing and developing a mathematical achievement test by following these steps:

* Making a content analysis of unit "sets" (the first unit in algebra textbook) to determine the concepts, relations, and applications.

* Building test items. The test consists of fifty items (Multiple-choice questions).

* Referring the test by some professors in mathematics education to verify the validity of this test.

* Modifying the test according to their opinions.

* Applying the test to a sample of pupils to determine:

- The time of the test (fifty minutes).

- The value of realability coefficient of the test (0.91).

6) Choosing sample from the first - grade pupils in the preparatory stage divided into six groups.

- Experimental groups (1) (45 male-47 female).

- Experimental groups (2) (44 male - 40 female).

- Control groups (51 male - 41 female).

7) Measuring the effectiveness of this strategy according to the following steps:

- Application of the mathematical achievement test to the six groups as a pre - test.

- Application of the writing activities as shown below:

  - Experimental groups (1) : writing activities as individual work.

  - Experimental groups (2): writing activities as group work.

  - Control groups: Do not use these writing activities.

- The method of applying these activities can be shown as follows:

  (a) The teacher explains the lesson.

(b) In the last five minutes, the pupils get one activity and answer within these five minutes.

(c) The teacher reads these written answers, then write his comments on each page and records all the answers in his notes.

(d) At the beginning of the next class (5 minutes), the teacher returns the corrected answers to the pupils.

(e) The teacher encourages the pupils with good answers to make a presentation in the front of the class.

(f) In the case of wrong answers, the teacher mentions them without stating the names of the pupils.

- Application of the same mathematical achievements test on six groups as a post - test.

8) The field test of this strategy was made in 20 sessions during September and October 1998.

9) The results were analyzed quantitatively and qualitatively.

The Results:

The results can be analyzed and divided into two parts:

(A) Quantitative Analysis of Results:

1) To satisfy about the first hypothesis, the analysis of variance was made. It can be shown as follows:

Table (1) shows the analysis of variance of the result.

The resource of variance	Square sum	Degrees of freedom	(squares mean) variance	F-Ratio	significant
Within groups	20634.55	262	67.76	3.04	Significant
Between groups	1198.2884	5	239.66		In 0.05 level

The previous table shows that there are significant differences between six groups related to the new strategy at 0.05 level. This means that the strategy has an effect on the mathematical achievement for the sample of this research. Therefore the first hypothesis was satisfied.

2) To satisfy about the second hypothesis, T - test was made between the means of two experimental groups' scores in a mathematics achievement test. The results can be shown in the following table:

Table (2) show the significant differences between the means of two experimental groups' scores, which works as groups or as an individual

Groupes	Number of pupils	Mean	Standard deviation	Degree of freedom	Calculate T - Test	Schedule T - Test	Significant in 0,01
Experimental (1)	92	32.27	9.84	174	0.06	2.60	No significant
Experimental (2)	84	29.68	9.30				

The previous table shows that there are no significant differences between the two experimental groups.

Therefore, this strategy had an effect on the mathematical achievement when applied as a group or as an individual work. Therefore the second hypotheses was not satisfied.

3) To satisfy about the third hypothesis, T - test was made between the means of male and female scores in the mathematics test. The results can be shown in the following table:

Table (3) shows the significant differences between the means of male and female scores in mathematics achievement test

Sex	Number of pupils	Mean	Standard deviation	Degree of freedom	Calculate T - T est	Schedule T - Test	Significant in 0,01
Male	89	29.76	9.68	174	0.063	2.60	No
Female	87	32.46	9.45				signify

The previous table shows that there are no significant differences between the mathematical achievement of male and female. This means that the effectiveness of this strategy does not depend on sex. Therefore the third hypotheses was not satisfied.

(B) Qualitative Analysis of Results:

To throw more light on the results of this research, the analysis of pupils answers on some activities were made as following:

- When the pupils were asked to write their suggesting to

help their friends to distinguish between two symbols, they suggested one of the following:

- Stating the definition of each symbol.
- Forming examples to explain the usage of each symbol.
- Establishing a connection between these two symbols and other symbols that are familiar to all pupils.
- Describing the shape of each symbol.
- Putting new rules or directions to help their friends to remember each symbol.

Through the previous answers, we can say that some pupils can create new rules or made new connections when they were put in a life problem **(See activity 1 and 2).**

- When the pupils asked to recall what they learned in written words, they preferred to write short answers such as writing the title or some easy examples. That means they recall the information as they heard without any creation. **(See activity 3 and 12).**
- When the pupils were asked to imagine that they met the scientist Venn,their answers in this activity indicated that the pupils were very interested to know a lot of information about him and how he discovered his diagrams but they did not like his name.They believed that this scientist could facilitate any mathematical problems they would face **(See activity 4).**
- When the pupils were asked to interpret some mathematical facts, they could state new examples or

create new diagrams to explain these facts **(See activity 5 and 6).**

- When the pupils were asked to explain some mathematical concepts or relations,they were able to give some examples or draw some diagrams to elaborate the concept or relation **(See activity 5, 7 and10).**
- When the pupils were asked to describe one diagram to his friends through the telephone, they tried to make a connection between this diagram and other familiar shapes **(See activity 8).**
- When the pupils were asked to create a problem, they followed the same examples provided in their textbook. When they asked to create a story about certain diagram, they could create a life story, but through their stories, their beliefs were reflected, particularly the negative role of women in the society **(See activity 9 and 11).**
- When the pupils were asked to make a self-assessment for their learning, they could determine their mistakes but they did not determine how could they get rid of these mistakes. They only could remember when they got rid of them **(See activity 14 and 15).**

From all the previous results and comments it can be said that the teacher can used these writing activities to improve the achievement of his/her pupils in mathematics. Also these activities can help the pupils to think and create a new solutions for their educational problems. Therefore the

teacher must try to establish a good classroom environment and encourage them to do so.

Recommendations:

According to the results of this research, the following recommendations can be made: -

- The teachers should receive some training on how to design writing activities before applying this strategy.
- The pupils should be encouraged to write if they lack motivation by presenting their best writing to the class receiving praise words like: good, well done or excellent.
- The teacher should use this strategy gradually, until he and his pupils can be familiar with it.

Suggestions for Further Research: -

- Measuring the effectiveness of using this strategy on the mathematical achievement of primary or secondary stage pupils.
- Measuring this effectiveness when pupils study geometry.
- Conducting a study to determine the level of the pupils (below average - average - advanced) who can find the best benefits from using this strategy.
- Conducting a study on a large scale to determine the difficulties, which challenge this strategy in the large Egyptian classrooms seating between 50 - 60 pupils.

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Appendixes

Appendix (1)

The Achievement Test

Circle the correct answer between practice:

(1) The digits on the telephone dial. (group - non group).

(2) The most beautiful cities in Egypt. (group-non group).

(3) {4} (group - non group - element).

(4) 7 (group - non group - element).

(5) Φ (group - non group - element).

(6) The digits group of the number 286428 is:

({8, 2, 4, 6} , {8 ,2, 4, 6, 8, 2} , {2, 2, 8, 8, 4, 6}).

(7) The alphabetical letters group of the word "رياضيات" is:

({ر، ت، ى، أ، ض} , {ر، ى، أ، ض} ,{ر، ى، أ، ض، ى، أ، ت}).

(8) {x :x is integer number , $3 \leq x < 6$} =

({3, 4, 5, 6} , {4, 5, 6}, {3, 4, 5}).

(9) {ح، ب، ص، أ} is the alphabetical letters group that constitute the word: (صفيح ، صباح، صلاح).

(10) {1, 2} is the digits group of the number (121 ,210, 201).

(11) The alphabetical letters group that constitute the word (إيمان) is:

(finite group - infinite group - empty group).

(12) {1, 2, 3, 4,.....} is:

(finite group - infinite group - empty group).

(13) {5, 10, 15, ...,50} is:

(finite group - infinite group - empty group).

(14) the even numbers group is:

(finite group - infinite group - empty group).

(15) The number of the elements group of the letters that comstitute the word (محمود) is: (5, 4, 3).

(16) The number of the elements group of the digits that constitute the number (212211) is: (2, 3, 6).

(17) The number of the elements group of the students aged 20 years in your class is: (20, 0, 10).

(18) The digit group of the number (26)..... the digit group of the number (6622). $(\in, \notin, =)$.

(19) 5.... the digit group of the number (15). $(\in, \notin, =)$.

(20) 4..... {1, 2, 3}. $(\in, \notin, =)$.

(21) If $x \in \{5, 7, 9\}$ then x = ... (5, 7, 4).

(22) If $x \in \{3, 4\}$ then x = ... (5, 3, 2).

(23) If $5 \in \{2, 1 + x\}$ then x = ... (5, 3, 4).

(24) {2, 4} ..... {4, 1, 2} $(\subset, \not\subset, \supset, \not\supset)$.

(25) {أ، ب} ..... {أ، ب} $(\subset, \not\subset, \supset, \not\supset)$.

(26) {2} ..... {0, 1} $(\subset, \not\subset, \supset, \not\supset)$.

(27) { } ..... {4, 2} $(\subset, \not\subset, \supset, \not\supset)$.

(28) If $x \subset y, y \subset z$ then ..... $(x = z, x \subset z, z \subset x)$.

(29) If $x \subset y, y \subset z$ then ..... $(x = z, x \subset z, z \subset x)$.

(30) The proper subgroup of the group {x, y} is:

$(\{x,y\}, \{x\}, \Phi)$.

(31) The improper group of the group {1, 2, 3} is:

({1} , {1, 2, 3}, {3}).

(32) {1, 4}∩ {1, 2, 3, 4} = ... ({1} , {1,4} , {4}).

(33) {12, 5, 6}∩ {2, 25, 7} = ... ({2} , {Φ} , {5}).

(34) If x∩ y = Φ Then the groups x and y .....

(equals, intersection, separately).

(35) If x ⊂ y then x∩ y = ... (x , Φ , y).

(36) If y ⊂ x then x∩ y = ... (x , Φ , y).

(37) {1, 2, 3} U { 2, 3, 4} = ...

({ 2, 3} , {1, 2, 3, 4}, {1, 2, 4}).

(38) The universal group of the group {red, yellow, blue} is color group of (Egrptian flag,rainbow, traffic lights).

(39) x U x = ... (Φ , U, x).

(40) (x) = ... (Φ , U, x).

(41) x∩ x = ... (Φ , U, x).

(42) $(x \cup y)' =$ ..... $(\Phi , x' \cup y', x' \cap y')$.

(43) $(x \cap y)' =$ ..... $(\Phi , x' \cup y', x' \cap y')$.

(44) $\Phi' =$ ..... (Φ , U).

(45) $U' =$ ..... (Φ , U).

(46) From the following diagram:y ٥ ٤ ٣ ٢ ١ x

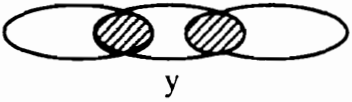
x = ... ({1, 2} , {1, 2, 3}, {1, 2, 3, 4, 5}).

(47) The shadow shape from the following diagram

y  x is ...

(x∩ y∩ z, x U y U z, (x∩ y) Uz).

(48) The shadow shape from the following diagram

x  x is ...

y

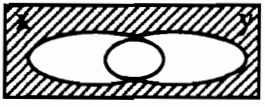
((x∩ y) U (y∩ z), x∩ y∩ z, x U y U z).

(49) The shadow shape from the following diagram

x  y is ...

(x-y, y-x (x-y) U (y-x)).

(50) The shadow shape from the following diagram

U  is ... (x\, y\, (x U y)\).

Appendix (2)

Writing Activities

Activity (1)

Many pupils were confused betweenj $\subset$,$\in$.

Write your suggesting to help your friends to distinguish between them.

Answers : some pupils:

- Stated the definition of each symbol.

- Formed examples to explain the usage of each symbol.

- Established a connection between these two symbols and other symbols that are familiar to all pupils such as:

- $\subset$ liken the shape of (c) letter, $\in$ liken the shape of (E) letter

- $\subset$ has similarity to an arrow, $\in$ has similarity to an arrow with a dash.

- $\subset$ has similarity to half of circle, $\in$ has similarity to half of circle with a dash.

- Stated this rule:

If one finds a number or letter without { } Put $\in$

If one finds a number or letter without { } Put $\subset$

Self refiection:

- Through the answers of pupils about this activity,the teacher can know some clues on how his/her pupils think and solve their educational problems.This valuable information can help him to deal with them in the future.

- Through this activity the teacher can develop the creative thinking of his/ her pupils.

Activity (2)

Many pupils were confused betweenj ∩ ,∪.

Write your suggesting to help your friends to distinguish between them.

Answers : some pupils:

- Stated the definition of each symbol.
- Formed examples to explain the usage of each symbol.
- Established a connection between these two symbols and other symbols that are familiar to all pupils such as:

- U liken the shape of (u) letter,∩ liken the shape of (n) letter.
- U has similarity to the number (٧),∩ has similarity to the number (٨).

- Described the shape of each symbol such as the following:
  - U "looks" up.
  - ∩ "looks" down.
- Described the property of each symbol such as:
  - U collects all the element in the groups.
  - ∩ takes the repeated elements only.

Self refiection:

- Through the answers of pupils about this activity, the

teacher can know some clues on how his/her pupils think and solve their educational problems. This valuable information can help him to deal with them in the future.

- Through this activity the teacher can develop the creative thinking of his/ her pupils.

Activity (3)

Write the important knowledge, which you learned in this week.

Answers :

some pupils:

- Stated the title if each lesson.
- Explain some concepts.
- Put some examples about the new mathematical concepts.

Note:

This activity applied at the end of each week during the field test of these activities.

Self refiection:

- Through the answers of pupils about this activity, the teacher can determine the quality and quantity of information that the students learned.

Activity (4)

Imagine that you met the scientist "Venn" anywhere.

Complete, I will:

- Ask him these questions .....
- Thanks him about .....
- Advice him to .....

Answers :

- The questions of the pupils are:
  - What is the meaning of the word "Venn'?
  - How did you discover your diagrams?
  - Why did you name these diagrams by your name?
  - Why didn't you use the open curve in your diagrams?
  - Why do we use these diagrams in mathematics only?
- The pupils thanked him about his:
  - Efforts to help them to learn mathematics.
  - Intelligence.
  - Great invention.
  - Interest to facilitate mathematics to them.
- The pupils advised him to:
  - Change his name.
  - Investigate other things in science.

- Continue his inventions.
- Change the following shape  because they can not write in this narrow area.
- Change the complex mathematical rules.

Self refiection:

Through the answers of pupils about this activity, the teacher can know their opinions about the scientist and their interests in this point.

Activity (5)

Write a letter to your friend to explain to him:

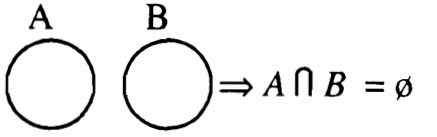
Why: $\varnothing \neq \{0\}$?

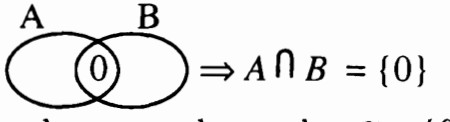
Answers :

- Some pupils stated that:

  - $\varnothing$ is an empty group but $\{0\}$ non - empty group.
  - $\{0\}$ have one element,$\varnothing$ haven't any element.
  - If we delete zero, they will be two equal groups.
  - The student who got zero in his mathematics examination is different than the student who did not attend the examination.

- A few pupils used Venn shapes to explain that as following:





It is obvious from these two shapes that $\varnothing \neq \{0\}$.

Self refiection:

Through the answers of pupils about this activity, the teacher can determine if his pupils understood this specific relation or not.

Activity (6)

Write a letter to your friend to explain to him:

Why : $(x`)` = x$?

Answers :

- Some pupils stated that:
  - (x`) `have the same elements of x.
  - The complement of the complement group equals the original group.
  - The complement of one student is the rest of his class and the complement of the rest of his class is this student.

Self refiection:

Through the answers of pupils about this activity, the teacher can determine if his pupils understood this specific relation or not.

Activity (7)

Your friend sends to you the following message:

I do not understand what is the meaning of "the proper sub group" and "the improper sub group".

Please send to me a letter, explaining what the meaning of each. And how I can distinguish between them.

Answers :

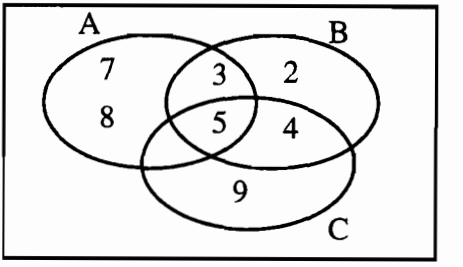
- Some pupils stated that:
  - Stated examples for each concept.
  - Described how to get each group as following:
    - The proper subgroup we are made some effort to get it. But the improper subgroup is taken as it is.
    - The proper subgroup not contains all the elements of the original group. But the improper subgroup contains all the elements of the original group.

Self refiection:

Through the answers of pupils about this activity, the teacher can determine the quality and quantity of the information, which his pupils learned.

Activity (8)

Describe the following shape to your friend through the telephone to help him to draw it. Put your description in written words.



Answers :

- Some pupils stated that::
- Stated only the elements of each group.
- Stated the elements of each group and intersection between each two groups.
- Stated the intersection between three groups then the intersection of two sets then the differences between each two groups.
- Described the shape in more details.
- Connected between the shape of the three groups with some familiar symbols such as the symbol of:
    - Olympic electric.
    - Olympic games.
    - Cooperative logo in gas station.

Self refiection:

Through the answers of pupils about this activity, the teacher can Know how the pupils used their mathematical language to express their background knowledge.

Activity (9)

Ahmad, Mohamed, Aly, and Mustafa are four friends who participate in many groups in their school as following:

- Mohamed, Aly, ans Mustafa participate in the football group.
- Ahmad, Mohamed, and Mustafa participate in the tennis group.
- Ahmad, and Aly participate in the music group.

Construct some problems that can be solved mathematically by using the above information.

Answers :

- Most of the pupils:
  - Supposed that:

    X = {Mohamed, Aly, mustafa}.

    Y = {Ahmad, Mohamed, Mustafa}.

    Z = {Ahmad, Aly}.
  - Put some questions such as:
    - Find: X U Y, X U Z, X U Y U Z.
    - Find: X ∩ Y, X ∩ Z, X ∩ Y ∩ Z.
    - Find: X-Y, Y-X, Y-Z, X-Z.
    - Represent about this knowledge by using Venn diagram.
    - Find the universal group of these groups.

Self refiection:

Through this activity, the teacher can develop the creative thinking of his pupils.

Activity (10)

Your friend sent to you this letter:

I don't understand or know:

When $X \cap Y = X$?

$X \cap Y = X$?

$X \cup Y = X$?

$X \cup Y = X$?

Please, send a letter explain to me these problems.

Answers :

Some pupils:

- Stated the right answer.
- Stated numerical examples For each Problem.
- Drew Venn diagram to explain each one.
- When X = Y in all cases.
- Stated that: $XUY = X$ when $Y = \emptyset$.

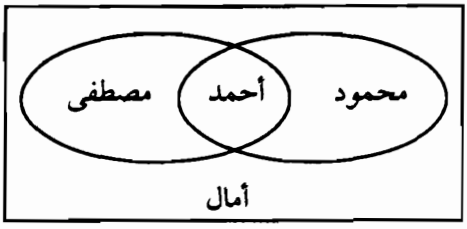
  and $XUY = Y$ when $X = \emptyset$.

Self refiection:

Through this activity, the teacher can help his pupils to discover special relations from general relation.

Activity (11)

Create a story that the following diagram express about it.



Answers :

- Ahmad, Amal, Mostafa, and mahmoud are four friends. They go to the club. Mahmoud and Ahmad played tennis. Mostafa and Ahmad went swimming. Amal sat down watching them.
- Ahmad, Amal, Mostafa, and Mahmoud are four friends. There is a problem between Mahmoud and Mostafa. Ahmad sat down with Mahmoud then sat down with Mostafa to solve their problem. But Amal did not participate in solving this problem.
- Ahmad, Amal, Mostafa, and Mahmoud are four friends. Amal likes to read journal. Ahmad and Mahmoud like to play football. Ahmad and Mostafa like to play handball.
- Ahmad, Amal, Mostafa, and Mahmoud are four friends. Ahmad and Mahmoud study mathematics together. Ahmad and Mostafa study science together. Amal studied alone.

Self refiection:

Through this activity, the teacher can develop the creative thinking of his pupils.

Activity (12)

Your friend is absent today.

Write a letter to explain today's lesson to him.

Answers :

Most of students:

- Stated the title of the lesson, then got the rule, then stated some easy examples similar to what the teacher said.
- Stated the concept and its symbol then gave some examples.
- Made a connection between the symbol of the concept and something familiar for them.

Self refiection:

Through the answers of pupils about this activity, the teacher can determine the quality and quantity of the information, which his pupils learned.

Activity (13)

"Oh I understand now..."

Write a letter to me explaining: when you said this expression?

Answers :

Some students write that they said this expression when:

- They studied; $(x^{-1})^{-1} = x$.
- They studied different topics in this unit.
- The teacher repeated the lesson.
- They studied from the mathematics textbook.
- They studied with their friends.
- They asked the teacher and got more examples.

Self refiection:

Through the answers of pupils about this activity, the teacher can determine the situations that helped his pupils to understand quickly.

Activity (14)

Think in the lesson "Operations on groups" and complete the following:

- The operation which was easy to understand was .....
- The operation which was difficult to understand was...
- During this lesson, I felt .....

Answers :

Most of the students wrote that:

- **The easy operation was:**
  - The union operation
  - The intersection operation.
  - The universal group.
  - All the operations.
- **The difficult operation was:**
  - The universal group.
  - The complement group.
  - There are no difficult operations.
- **During this lesson, they were:**
  - Happy.
  - Relaxed.
  - Safe.
  - Understood every thing.
  - Felt that mathematics is easy.
  - Felt that this lesson is interesting.

Self refiection:

Through the answers of pupils about this activity, the teacher can determine the easy and difficult topics for the students. Accordingly, the teacher can modify his method of teaching.

Activity (15)

In the lesson entitled "the difference between two groups" state three mistakes you made and how you faced or got rid of these mistakes.

Answers :

- Some students faced these mistakes:
  - Calculate Y - X instead of X - Y.
  - Calculate X - Y as X without subtracts the intersection of the two groups.
  - Did not distinguish between the complement group and the difference between two groups.
  - Calculate X -Y as XUY
  - Calculate X -Y as X∩Y.
  - Calculate X -Y as XUY - X∩Y
- Some pupils can face or get rid of these mistakes when:
  - The teacher repeated his explanation.
  - The teacher corrected it.
  - His friend corrected it.

Self refiection:

Through the answers of pupils about this activity, the teacher can determine the mistaxes of his pupils. Also, this activity helps his pupils to make self - assessment of their mathematical knowledge.