

Effectiveness of teaching by using mastery learning on habits of mind of student of fourth preparatory grade scientific section in physics

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Abstract:

This research aimed to evaluate the effectiveness of teaching by using mastery Learning on habits of mind of student of fourth preparatory grade scientific section in physics. In order to achieve such an aim, an experiment is conducted during the second semester of (2016-2017) academic year for the fourth scientific graders in Al_Rafidain preparatory school for boys, which is randomly selected out of (17) preparatory schools in the directorate of education in holy Karbala. The sample of the research includes (69) students which are divided into two groups: an experimental group of (34) and control group of (35) and their equivalence were according to the following variable (previous achievement, age, intelligence, previous information, habits of mind). Researchers choose the experimental design that involves two equal groups. They also use measure of habits of mind in physics for verifying the null hypothesis of this researcher which include (40) items. Validity and reliability of the measure are assured and it applied after finishing the experiment. The results are analyzed statistically by using (T-test) for two independent samples and they indicate that there is a statistical significance difference for the experimental group with measure of habit of mind. Thus, the researchers form their recommendations and proposals according to the results.

1. The research problem

one of the main objectives of teaching is to arouse learner's mental ability and his self-activity in order to achieve the required change to the individual. This change is a result for interior or inferior stimulus, thus learner's positivities must be focused as well as what the knowledge that he would gain and contribute in modifying his behavior in the light of the skills and experiences that learner get under supervision and guidance of his teacher. One of the effective variable that led to a bad educational outcomes that are represented in present day learner, is using traditional methods of teaching by teachers and neglecting the modern methods. This led to produce learners of low scientific level in school subjects and especially in physics which is considered one of the scientific subjects that has a

good relation with the student and his environment. Poor scientific level of learners appears through their scientific attainment. Thus. This proves traditional methods of teaching in achieving the scientific and educational objectives in physics during preparatory stage. The objectives that are intended to be achieved includes improving the scientific side within learner as well as forming and developing learners habits of mind which is poor and inactive. Some studies prove that there is decline in acquiring the habit of mind by learner of scientific fourth preparatory grade. One of these studies is (Shedhan, 2015). Another study (Kadhim, 2011) shows that scientific attainment of learner stresses that learners including the distinguished students have the ability to save and retrieve knowledge without understanding and absorbing this knowledge. This appears when learner perform certain skill that he acquires previously because they do not use the habit of mind within different scientific and educational activities in school subjects (Kadhim,2011,2).

The researchers try to form suitable educational model to achieve a kind of teaching of great effectivity which makes the learners effective, participant and with great level of attainment during educational process. Such model deals with develop habit of mind. Thus the researchers rely on using mastery learning model as an escape that could facilitate 1 habit that could help in learner. The researchers define the problem of the research with the following question:

What is the effectiveness of mastery learning in habits of mind of the scientific fourth preparatory in physics?

2.Importance of research: Importance of research can be summarized with following points:

- A. The research deals with mastery learning model and its effectiveness in habit of mind that this model never used before in teaching physics as well as the mentioned variables in our society (as far as the researchers know)
- B. It deals with the importance of mastery learning as a model for physics in preparatory stage that can contribute in increasing scientific attainment

in physics and developing habit of mind of students.

- C. This research shows the necessity of developing habit of mind of preparatory stage students because of importance this stage as well as helping those students in handling huge amount of knowledge with close and productive look.
- D. This research shows the importance of physics as it is cornerstone of sciences of special sciences and its effective role in developing our societies. These sciences can be made more effective by using modern methods and styles of teaching as well as organizing concepts with mastery learning Objective of Research

3.The aim of the research

This research aims to identify the effectiveness of mastery learning model in habits of mind for the student of fourth scientific preparatory stage in physics.

4.The Hypothesis

in order to achieve the aim of the research, researchers set the following null hypothesis :- (there is no statistical difference at significance level (0.05) between the average of experimental group students' marks who study school subject with mastery learning and the average of control group students' marks who study school subjects with the traditional method according to the measure of habits of mind in physics).

5.Research limits: The current research can be determined as below:

- 1- Students of fourth scientific preparatory grade in preparatory governmental school that are affiliated to the education directory within city center of holy Karbala.
- 2- Second term of 2016-2017 academic year.
- 3- Chapters (6, 7, 8, 9) of physics book for the fourth scientific preparatory stage seventh edition, 2016.

6. Definition of terminologies

- **Mastery learning model:** it is defined by (Huaidi, 2005) as : " a kind of learning that is performed inside classroom depending on the

concept of providing the learner with educational notions of specified objectives previously and never allows the learner to pass certain stage to another unless he masters the previous stage (A'atia,2015:413).

- **Researchers define** in this research as specifying the limits of mastery with (80%) which must be achieved by students. This can be done through a diagnostic test which is set by the researcher and it is applied at the end of each lesson in order to check the objective that the learner never attain and this followed by remedial methods such as feedback and extra teaching and then doing a test at the beginning of the next lesson to the test item that are not mastered with (80%) to make sure that they are mastered before moving to the next lesson.
- **Habits of mind:** it is defined as (Costa & Kallick,2000): "manners of intelligent behavior that manage and organize mental processes and they are result to the responses of the learner to certain kinds of problem that need thinking and consideration. These responses change as a result of repetition and training into habit that are used when facing problem quickly" (Costa & Kallick,2000,p8).
- **They are also defined by researchers practically as :** thinking and intelligent behavior skills that the students of fourth scientific preparatory grade show and prefer while they learn physics. They represent six habit of mind and they are: thinking flexibility, Questioning and Posing Problems, thinking about thinking (metacognition), gathering data through all Senses, applying past knowledge to new situation, (Striving for Accuracy and Precision) all these habit can be measured through the mark that student get by using measure of habits of mind that is set for this sake.

7. Theoretical background

Mastery Learning Concept: it is a competency or performing an acute act which have a quantities level that is specified previously and it is needed to be done by every learner when finishing the educational situation.by using such level the learner is judged whether he master the educational item or not , that is mean judging the outcomes of education and learner's efficiency during doing his duty (Alfetli,2016:214).

Mastery learning is based on a concept that majority of learners can achieve high level of ability of learning if the school subject are offered to them orderly and sufficiently , offering them help whenever they are faced with any kind of difficulty and giving enough time to obtain the mastery of the

scientific subject with using a clear measure of mastery (Ali, 2011: 66)

One of mastery learning is that the teacher and the learner participate in executing the lesson and puts the learner in state of alertness to link the previous information with next one. This also develops thinking skills of the learner and it takes individual differences between learners in consideration. Mastery learning also harmonized with the modern theories that are based on the positive interaction between teacher and learner which leads to increase learner's preparation (Zayer and Esmā'a, 2016:176). Basic models of mastery learning: there are three basic model of mastery learning and here is a brief presentation of them:

First: Carol's model (1963): carol set a model for school education in (1963) that is based on the notion of mastery learning. This model represents a formation of theory that shows the degree that the learner attain in education which is specified with the amount of time allotted to learn certain educational task in comparison to the necessary time to master this task. This model links between the kind of education and time variable that is allotted to it on one hand, and learner's scientific attainment on the other hand. Carol explains that the learners are distributed moderately according to preparation when learning certain school subject.

Second: Clair model: it is a model set by Clair for individual education at (1963). This model is aimed to make the educational process as an individual process without neglecting interaction between the learner and the teacher. This model is based on two assumptions: difference in the speed of learning among learners and education needs continuous evaluation by directing the process of education in addition to fragmenting of the educational subject into small items according to specified educational objective and tests and at the same time, it never allows to pass from one item to another only if the test assures mastery level (Ma'ayuf, 2002:23)

Third: Bloom's model: this model depends on four hypothesis that could be briefed as fallow: learner can learn if there is something to be learnt and he has the ability to learn, learner learns well if the education has special meaning, disappearance of individual difference in the shade of appropriate situation for education and the difficulty of learning comes from educational errors that are not corrected with absence of feedback (Al-Rubaie,2006:193)

Stages of mastery learning: bloom defined three stage for mastery learning :

First: planning and preparation stage: it includes the following steps:

- 1- Analyzing the content to extract subjects' behavioral objectives.

2- Dividing the academic content into groups of subjects and setting a plan to teach them.

3- Designing a brief test for each subject alone in the shade of its specified objectives in order to measure the amount of mastery that each learner achieve in the main subjects.

4- Specifying mastery level in the shade of the audiometer of calender which is varies between (80-90)%.

5- Designing final attainment test which is based on the content on the course and its educational objectives.

Second: executing stage which includes the following:

1- Teaching each subject of the course according to a time plan by using organized strategies for collective teaching.

2- Doing a brief test for each subject after finishing it.

3- Collecting learners answer after each subject and checking them to define strength and weakness points.

4- Presenting a suitable feedback according to the test results where enrichment programs are used for perfect learner while treatment program are used for non-perfect learner.

Third: stage of evaluation and following: it includes: applying attainment test after finishing the content and check it then extracting , analyzing and explaining the results of the final attainment test (Ali, 2011:167-169).

A'atia (2016) indicates that mastery learning is done through one lesson or more , thus it differs from individualization of education according to Clair's plan where education is designed according to it and it is based on individual education and not collective (A'atia, 2016: 262).

Basic element of mastery learning: Carol and Bloom have the same element basic mastery learning and they are:

Defining the cognitive objectives of education accurately, measuring initial readiness of the learner and identifying his initial information about the present lesson to enable the teacher to know the start point, presenting school subjects with multiple strategies, means and styles, formative evolution to identify what is achieved out of the objectives as well as identifying clearness of course content to the student, introducing suitable solutions and treatment based on the result of formative evaluation and comprehensive evaluation for what is going on at the end of the course (Al-Hashmi , 2008:255).

Formative tests: they are organized evaluative process which takes place during teaching and the objective of using tem is to provide the teacher and

the learner with the feedback for the sake of improving the educational process and defining the progress that the learner achieved (Melhem, 2012: 376).

Treatment methods: researchers choose effective methods with paying attention to the availability of suitable time for performing these methods which are:

Feedback: it is the information that the learner gets before or during the lesson performance with different ways to improve or enhance the response as well as the ---- behavior that has great effect in teaching the skill or mastering it (Al-Rubaie, 2006:202)

Homework: to perform the lesson with high degree of success, the learner must do their homework since homework means understanding lessons and this achieves homework objective (Mutawali, 2012:177).

Diversity of education sources: watching scientific films of relation with lessons content through internet which represents audio visual means< researchers contribute into make themselves available through (phyzia'a phyzia'a) website to publish intended films.

Strategies used in the research: researchers use three effective strategies in presenting scientific material which they are (discussion strategy, numbered-head-together strategy, think- twin - participate strategy

2.habits of mind mind is one of the greatest gifts that Allah endows to us and it is fairly enough for mind to be in the rank of responsible for commissioning as well as god make man superior to other creatures. Thus based on such introduction, man has to train his mind to think since it is the tool of thinking whether the man use it or not (Al-Rabegy, 2015: 57).

Mental habits is considered one of the most important and modern subjects since developing habit of mind means sound thinking habit within learners. These habits help learners in facing problem easily and they help him to develop his mental abilities and as a result his scientific progress. Habits of mind give him developed skills of thinking because learner is required to use his mental abilities to think in all situations in order to be daily habit and not to be specified to certain situation (Al-qawas, 2013:5).

Hypothesis that habits of mind based on: habits of mind are based on a group of hypothesis that constitute the theoretical basis for habit of mind training to make the mind more effective and these hypothesis are:

- Mind is the tool of thinking that can work with high level of efficiency.

- Everyone has a mind and he is able to use it as he wants and with enough power to direct it

spontaneously and then managing it as well as evaluating and modifying it.

- Outcomes of functioning mind can be obtained through teaching habit of mind.

- We can specify a group of habits of mind to get the superior efficient performance for each habit.

- We can add new habit through functioning our minds and discovering its capacity.

- We can organize an educational situation to achieve acquiring habit of mind within certain school subject.

- Habits of mind include using our minds to have our minds in managing it within any level.

- We can get good performances that develop skills which appears as noticeable performance and we can measure it by specifying habits of mind accurately (Abu Seif, 2014, 52-53).

Costa and Kallick classification of habits of mind

this classification includes sixteen intelligent behaviors that indicate habits of mind. The present study is aimed to develop six habits of mind out of them within students of fourth scientific preparatory grade. They are:

1- Thinking flexibility: it is the ability to change learners 'opinions when they get additional information, and to depend multiple methods by learner to solve problem and check them from different aspects.

2- Questioning and Posing Problem: it refers to learners ability to pose question as well as multiple choices to solve problems they are faced with (Al-Qureny, 2015:72-73).

3- Thinking about thinking: it is the ability that the learners use to remember the required steps of their work and then describing what they knew and what they need to know as well as their ability to evaluate their plans (Kutami and Aumema, 2005:112).

4- Gathering Data Through all Senses: learner use all their senses to gather information , and the objective of this is to achieve high level of understanding in solving problem (Kefaf &Noor, 2015:58).

5- Applying Past Knowledge to New Situation: when learner face a new confusing problem, they will retrieve their information storage as a source (Abu-Reyash and Zehria, 2006:293)

6- Striving for Accuracy and Precision: taking enough time in checking things and reviewing rules, continuous work for making the job more perfect and

accomplishing duties more accurately (Al-Rabegy, 2015:107-108). Costa and Kallick (2015) see that there is no one work to use all habits at the same time thus

teacher choose habits of mind in accordance with their students need and type of the scientific content the learn (Costa and Kallick, 2015:145).

Importance of acquiring habits of mind: it includes:

- 1- Giving
- 2- learner the chance to practice the habits of mind during process of learning practically.
- 3- Helping learners to get rid of useless and non-productive habits within their life.
- 4- Giving learners the opportunity to check their path of thinking and discovering how their minds work to solve problems.
- 5- Learners' acquisition of useful habit through life such as habit of insistence that can help
- 6- them to finish the works the started and open
- 7- minded habit.
- 8- Training learners to plan accurately according to the important requirements they do.
- 9- Giving the learners the opportunity to think with their own way even it is strange in order to make education more enjoying.
- 10- Helping learners to possess the will to use mental skills and abilities in daily educational activities to make learner believe that thinking is a habit practiced by learner without tiredness (Sa'ed, 2006:430).

7. Research methodology and procedures

To check research procedures the following are being done:

First: methodology: researchers choose experimental method, and as the research has one independent variable and one dependent variable. Researchers choose experimental model with two equivalent groups (experimental and controlling).

Second: research sample: sample of the present research includes all students of fourth scientific preparatory in governmental preparatory schools in city center of Karbala in the academic year (206-2017), and the researcher choose research sample randomly (lot) which is al-Rafidian preparatory school in order to do their research. Two section of that school are being chosen randomly (Lot) and they are section (A) which is the experimental group (34 student) and section (B) which is the controlling group (35 student).

Thaird:Equivalence of research group: table (1) shows equivalence of research group at freedom degree (67) as follows:

Table (1) equivalence of experimental and controlled groups

variables	Expr. group		Conrl. group		T value		Statistical indication at (0.05) level
	mean	Standard deviation	mean	Standard deviation	calculated	Tabled	
Previous attainment	63.62	17.02	63.26	18.10	0.085	2	Non-indicative statistically
age	189.5	8.06	193.26	10.97	1.605		
Previous information	10.15	2.24	10.29	2.14	0.263		
intelligence	20.71	6.14	19.54	7.53	0.702		
Habits of mind	128.41	10.47	128.17	10.58	0.095		

Fourth: controlling non-experimental 1- variable: non experimental variable are controlled for sake of experiment safety that may affect experiment safety negatively and they are: choosing the sample randomly, performing the experiment without any accident, experimental depreciation, maturation, using the same tool, research privacy, same school subjects, teacher period and classroom environment.

Fifth: research requirements:cientific content are specified with chapters (6,7,8,9) within physics course for the fourth scientific preparatory grade, seventh edition 2017. 177 behavioral objectives are formed according to Bloom classification within knowledge field and it consists six level hierarchically arranged. 24 study plans are set for the experimental group that is taught with mastery learning and 24 study plans are taught with normal method. To verify the validity of objectives and plans, they are shown to a group and experts and specialists who presented guidance to modify them. Mastery level that is adopted is (80%) according to specialists. Researchers set brief formative test for each lesson as well as remedial reminders which interpretive represent feedback where the learner are given homework whether he is mastered the lesson or not.

Sixth: Research tool: researchers form a measure for habits of mind as follows:

1- Specifying measure objective: measure of habits of mind is aimed to measure students' habits of mind within chosen sample.

2- Specifying range of habits of mind measure: in order to form a measure of habits of mind, researchers choose Costa and Kallick classification 2000 as a basis . they also form a perspective for each habit of mind within this classification which they are 16 habits. They are also presented to group for specialists to define habits of mind that may suits student and physics subject in fourth scientific preparatory grade as well as it suitability for applying the research with specified time. (80%) mastery percentage are being used for six habit of mind which is : thinking flexibility, Questioning and Posing Problems, thinking about thinking (metacognition), gathering data through all Senses, applying past knowledge to new situation, Striving for Accuracy and Precision.

3- Preparing items of habits of mind measure with its basic form: s researcher try to form items habits for the six mentioned habits with seven items for each habit in its basic form. These item are submitted to a group of specialist to assure their virtual validity and to be modified if necessary. Two items are deleted thus the measure includes 40 items.

4- Standard of correcting measure: the experts agree 100% that equivalents of the for measure positive items with degrees (1,2,3,4,5) for the

equivalents (Always, often, sometimes, rarely, ever) respectively as well as negative items quite the contrary, thus the highest degree within the measure is (200) and the lowest is (40).

5- Setting answer directions: researchers set answer directions that are compatible with measure items to make the measure easy for the students.

6- Survey application of the measure:

-First survey application: measure is applied on sample of (30) students of fourth scientific preparatory grade in (Al-Eqtidar preparatory school for boys) on Thursday (15/2/2017). Clearness of directions answers of students and understanding items. Time average is (35) minutes.

7- Statistical analysis of measure items:

-Discriminatory power of habits of mind measure: researchers corrected student answers and they are arranged correctly. They choose the upper group that represent (27%) of sample degree and lower group which is represented with (27%) of sample degree. Discriminatory power of habit of mind measure are measured with (T-test)for two independent samples and for each item of habits of mind measure for high and low groups. Results show that coefficient discriminatory of habits of mind measure items varies from (2,14-6,99) and it is bigger than tabled value which is (2), thus all values are statistically indicative. This assure items ability to discriminate.

- Structure validity (internal harmony): internal harmony is calculated with Pearson correlation coefficient and as follow:

- Finding relation between each item degree and the total degree of the measure. The statistical results also indicates that correlation coefficient value varies between (0,31-0,58) and there is a relation between degree of each item and its field degree also indicate that the value of correlation coefficient varies between (0,42-0,74) and there is a relation between relation between each field degree and the total degree when results of statistical analysis varies between (0,71-0,85). All this refers that results are indicative at indication level (0,05).

- Measure reliability: researchers use alpha Cronbach's equation that its value (0,89) and reliability coefficient is good thus the measure is reliable.

8- Measure of habits of mind's final form: the final form for physics includes (40) item whether they are positive and in such way, measure is applied.

Seventh: experiment application: researcher perform the experiment practically at Tuesday (21/2/2017) for both groups of research where two experimental groups are taught with mastery method according to the prepared daily plan as in the following steps:

- A. Making the student familiar with the objectives that are intended to be achieved.
- B. Measuring student s' through asking them a question about the pre-readiness that students have concerning the lesson start point.
- C. Presenting academic material with different strategies (the researchers use three strategies) and different styles and means (they use presenting scientific films and photos).
- D. Doing brief formative test at the end of each lesson in order to measure student level of mastery to basic items of the lesson.
- E. Grading students' sheet of answers in the same day.
- F. Giving students their sheets of answer accompanied with written feedback that include true answers of the test , some explanation , extra –homework for those who mastered the lesson as well as reinforcing homework for those who don't mastered the lesson to give them enough time to master the lesson.
- G. Doing brief test at the beginning of the next lesson for those students who don't mastered previous lesson especially for those items that do not achieved intended required level of mastery at the previous lesson.
- H. Repeating previous steps of each lesson till ending academic lesson.
- I. Control group are taught with the normal method in the light of daily plan prepared by the researchers.

Eighth: applying research tools: experiment is ended at Tuesday (18/4/2017) and researchers do:

Measure of habits of mind application: it applied by researchers at Tuesday (18/4/2017) and they do the following:

8.Presenting and explaining results:

First: presenting results: results are presented in order to check the null hypothesis which states that

there is no statistical difference of indication at indication level (0.05) between students of the experimental group who are taught with mastery learning method and mark average of students who are taught with ordinary method for habits of mind. Thus T-test are used to check the validity of research hypothesis by defining the indication of the difference of marks average between experiment groups.

Table (2) T-test results for defining the difference indication of marks averages according to measure of habits of mind

Groups	Number	Statistic average	Standard deviation	T-test value		indication
				calculated	tabular	
experimental	34	148.15	14.94	3.619	2	indicative
control	35	136.11	12.61			

This means supremacy of experimental group which is taught with mastery learning method thus null hypothesis is refuted because there is a difference of statistical indication between research group and this difference for the account of experimental group since it is taught with mastery learning method in physics.

Effect size: researchers use Eta square (η^2) for measuring effect size, the value of the independent variable for habits of mind is (0,164) and such value is high according to (Christopher, 2006:403) where values are between (0,01 simple, 0,06 moderate, 0,14 high).

Second: Interpretation of results: researchers interpret results as follows:

A. Mastery learning method contributes to make the learner able to understand course through discussion between teacher and students as well as posing question and the attempt to answer them. this helps in developing habit of posing question and answering them while diverting method of teaching by using different methods for explaining lessons that contributes to use the habit of using senses in gathering information.

B. Listening to the different point of views and what learner learns from each other and their teachers make them to think about their thinking, look for their thinking defects, try to modify it. All this has clear effect on habits of thinking about thinking and thinking flexibility.

C. Formative tests contribute in developing habit of using previous experience to answer questions which are new situation. Written feedback contributes to make students know their mistakes that increases students motivation for striving for accuracy and precision for getting full perfection and desire for making results effective.

9. conclusions: researchers conclude the following based on the results:

- 1- Effectiveness of mastery learning method in teaching physics for students of fourth scientific preparatory grade to increase their habits of mind.
- 2- Teaching with mastery method remains in line with development because there is possibility for using any new strategy in presentation.

10: recommendation:

researchers recommend the following:

- 1- Necessity of arranging training courses for fourth scientific preparatory grade physics teachers in order to make them use new methods strategies of teaching including mastery learning method to remain in line with development in educational process.
- 2- Teacher must pay attention to develop habits of mind of students in all grades.

Fifth: Proposals:

in order to complete this research, researchers proposed the following:

- 1- Making similar study that use mastery learning with different variables such as (creative thinking, scientific tendency, meditative thinking, mental motivation, test anxiety, Self-efficacy and stress)
- 2- Making a survey study about habit of minds in physics for students of intermediate and preparatory stages and methods of developing these habit .

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