

# Learning Skills of Junior High School Students and their Academic Performance in Chemistry

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**Abstract:** *Most students believed that chemistry was a challenging subject to learn and that it required higher level thinking skills. Students, in this way should possess 21<sup>st</sup> century skills since it gives an emphasis on utilizing the higher levels of thinking of the students. This study investigates the relationship between the learning skills of junior high school students and their academic performance in Chemistry. Using Marzano's taxonomy of learning, the study evaluates students cognitive, metacognitive, and self-system learning skills. The teaching strategies, methods, and techniques used by science teachers are also examined. The study concludes that students who have mastered higher - order skills perform better in Chemistry.*

**Keywords:** Learning skills, academic performance, teaching strategies, methods and techniques

## 1. Introduction

Learning is a lifelong process that starts at birth and lasts all the way up to death. It is a process whereby a person applies their prior knowledge to new circumstances. At school, learning happens when students are able to grasp a concept mentally or physically; when they interpret a concept into their own words or actions; when they combine newly acquired ability or knowledge with existing skills and understanding; and when they act on the new knowledge or skills and take ownership of them.

Learning skills help students learn, and so considered as vital to success in school and beyond. Higgins S., et. al (2007) used the broad term, 21<sup>st</sup> century skills, to describe the various learning skills needed to acquire new skills and knowledge, particularly in a formal learning setting, such as school or university. But, the National Academies Press (2012) thought that the term was broad and thus identified three domains of competence that can describe the 21<sup>st</sup> century skills—the cognitive, intrapersonal, and interpersonal. They further define 21<sup>st</sup> century skills as related to Bloom's Taxonomy of Learning which has been later improved and revised into Marzano's new taxonomy of learning.

Taxonomy of learning consists of six levels, with the three lower levels - - - knowledge, understanding, and application being more basic than the higher levels - - - analysis, synthesis, and evaluation. Some think of the levels as a stairway, in which learners are encouraged to achieve a higher level of thinking (David L., 2014). If the student has mastered a higher level, then he or she is considered to have mastered the levels below. Furthermore, Larson (2011) showed in his study how these skills directly impact teaching and learning. According to him, classroom teachers need to be familiar with these skills and integrate them throughout the curriculum. This means that 21st century skills need to be identified and need to be taught and integrated across the current curriculum by providing students with engaging learning opportunities such as posing higher order questions across all subject areas. However,

Thoughtful Learning (2012) found out that teachers struggle to pinpoint the precise abilities and skills that each student possesses in each subject since there are so many distinct types of learners, each with unique learning strengths and limitations that have an impact on their academic performance.

In science education, one of the unique and fascinating discipline and subject is the Chemistry. It is one of the most important branches of science. However, it proves as a difficult subject for many students and teachers since it requires higher order thinking skills, it is hard to teach and harder to comprehend (Adeyemo, 2010).

Thus, it is in this very reason why this study is conducted - - - to find out the learning skills of students in relation to their academic performance in Chemistry subject. Specifically, this study sought to answer the following: What is the academic the academic performance of Grade 9 students in their Chemistry subject? What are the learning skills of grade 9 students in terms of cognitive system, metacognitive system and self - system? What are the teaching strategies, methods and/or techniques used by science teachers in teaching grade 9 science subjects? Is there a significant relationship between the learning skills and academic performance of grade 9 students? What plan of action can be developed after identifying the learning skills of the students?

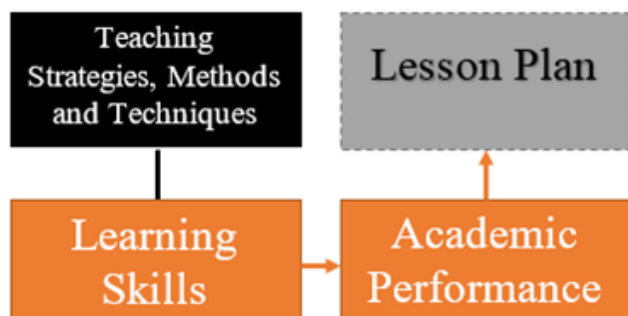
This study was anchored on theories of Bloom's Taxonomy of Learning and Marzano's Revised Taxonomy of Learning together with other theories such as 21st Century Learning Skills, and Gagne's Cognitive Learning Theory.

Bloom's Taxonomy is a hierarchical model that categorizes learning objectives into varying levels of complexity, from basic knowledge and comprehension to advanced evaluation and creation. Six levels make up Bloom's model, with knowledge, comprehension, and application being the three lower levels and analysis, synthesis, and evaluation being the three upper levels. Some people perceive the levels as a stairway that pushes students to think at a higher level

(David L, 2014). The centerpiece of Bloom's research was consciously geared toward categorizing educational goals in accordance with their level of cognitive complexity. Bloom was interested in offering a practical aid that was consistent with knowledge of the characteristics of higher mental processes.

On the other hand, Marzano's model of thinking skills was created to address the shortcomings of the widely used Bloom's Taxonomy and the current environment of standards - based instruction. It incorporates a wider range of factors that have an impact on students' thinking and offers a more evidence - based theory to assist teachers in enhancing their students' thinking (Intel Education Initiative, 2012). The three systems of Marzano's taxonomy are the Self - System, the Metacognitive System, and the Cognitive System. The Self - System determines whether to continue with the current behavior or begin the new activity when given the choice to do so; the Metacognitive System establishes goals and monitors their progress; and the Cognitive System processes all the necessary information. In this study, the researchers made use of the students' prior knowledge in Chemistry to determine the learning skills they possessed through an assessment which includes hierarchy of skills that increase in complexity.

The conceptual model of this study shows the teaching strategies, methods and techniques which affects the learning skills of an individual, in a sense that it brings out the skills of the students in every learning aspect. The learning skills correlate with the academic performance of the students. This was based on the belief that the learning skill of the students determines the academic performance or the ability and the capacity of a student to get high/low grades in their own work/performance.



This study was conducted to find out the learning skills of grade 9 students in relation to their academic performance in Chemistry. In particular this study is significant to the following: Through this study, school administrators may determine the needs of the teachers in improving what they have by planning some activities or giving them extra trainings and seminars that will also help in catering the needs and development of each student. The result of this study may serve as basis of their effectiveness in their teaching career. It will also help them to think another strategies, techniques and methods in enhancing the teaching - learning process in science subjects. Through this study, students may be able to discover their own learning skills. It may help them realize the importance of having these skills to ensure a better academic performance. This study may also help students to boost their confidence as they took one

step at a time in developing and improving themselves as an individual with full of skills and ability to grow. The result of this study may help the parents to monitor the progress and guide their children in improving the learning skills they possessed. The result of this study may serve as one of valuable source of data for the future researchers in conducting studies. Furthermore, it also helps them to find another way of catering students' learning skills.

## 2. Methodology

This study used the descriptive correlational - survey research design which involves looking at the relationship between the variables and the levels of interaction between the variables (Calmorin, L. P & Calmorin, M. A, 2007). Descriptive research design was used to describe the collected data that determines the learning skills of the grade 9 students in relation to their academic performance in Chemistry.

This study was conducted at one of the public secondary schools in the Municipality of Panitan, Capiz, Philippines. The respondents of this study were the science teachers and the grade 9 students who were officially enrolled during S. Y.2017 - 2018. A total of 12 science teachers were obtained by choosing all the teachers who handles science subject. A sample of 192 grade 9 students from all sections was also obtained using the Cochran's formula. These samples were then randomly selected from the total population of 445 students through simple random sampling technique which is the drawing of lots. In drawing of lots, each individual in the population was assigned a number which is written on a piece of paper numbered as 001 to 445. The pieces of paper were rolled and placed in a box and mixed thoroughly. The rolled paper was drawn from the box one at a time (Calmorin, L. P & Calmorin, M. A, 2007).

This study was conducted to determine the learning skills of grade 9 students and its relationship to their academic performance in Chemistry. A researcher - made test and a researcher - made checklist were used as data gathering instrument consisting of two parts: Part I is a 50 item test anchored to the learning skills of Marzano's new taxonomy of learning. Part II is a rating scale which includes the information on the science teachers about the teaching strategies, methods and techniques they used in teaching science subjects.

The researcher - made instruments were subjected for a content validation with the following experts namely 5 science teachers with master's degree in education and an expert in the field of research. When all of the validators agreed that a certain item was important and should be included in the test created by the researcher, it was deemed valid. After the validation, corrections were incorporated. The revised and finalized research instruments were then subjected to a pilot test to the respondents who were not part of the study. After gathering the data, the researcher - made test got a coefficient alpha value of 0.72 using the KR - 20 (Kuder - Richardson 20) reliability test. While the researcher - made checklist got a coefficient alpha value of 0.872 using the Cronbach's alpha reliability test.

After establishing the validation and reliability of instruments, it was reproduced according to the number of respondents covered in the study. The researchers sought permission from the good office of the principal of one of the public secondary schools in the District of Panitan to conduct a study on grade 9 students in regards to their learning skills in Chemistry and to the science teachers for their teaching strategies, methods and/or techniques. The researchers also secured permission and set a schedule to communicate with the advisers of grade 9 students to gather information about their students' second quarter grades in Science.

### 3. Results and Discussion

#### Academic Performance of the Students

Table 1 shows the distribution of the respondents according to their grades in Chemistry in the second grading period. Thirty nine point sixty three (39.063) percent or 75 of the respondents received grades of 90 to 94 given an interpretation of *Superior*. Twenty six point five hundred sixty three (26.563) percent or 51 of the respondents received grades of 85 to 89 given an interpretation of *Very good*. Thirteen point five hundred forty two (13.542) percent or 26 of the respondents received grades of 80 to 84 given an interpretation of *Good*. And, one point five hundred sixty three (1.563) percent or 3 of the respondents received grade of 95 to 100 given an interpretation of *Excellent*.

However, there were twelve point five hundred (12.500) percent or 24 of the respondents received a grades of 70 to 74 given an interpretation of *Conditional Failure*. Six point two hundred fifty (6.250) percent or 12 of the respondents received grades of 75 to 79 given an interpretation of *Fair or Passing*. And, zero point five twenty one (0.521) percent or 1 of the received grade of 65 to 69 given an interpretation of *Failure*.

This implies that majority of the students performed well in their Chemistry subject because more than sixty five (65) percent of the respondents received grades of 85 or even higher.

**Table 1:** Distribution of respondents according to grade in second grading period

Grade Interval	Frequency	Percentage	Verbal Interpretation
95.0 - 100.0	3	1.563	Excellent
90.00 - 94.00	75	39.063	Superior
85.00 - 89.00	51	26.563	Very Good
80.00 - 84.00	26	13.542	Good
75.00 - 79.00	12	6.250	Fair or Passing
70.00 - 74.00	24	12.500	Conditional Failure
65.00 - 69.00	1	0.521	Failure
<b>Total</b>	<b>192</b>	<b>100</b>	

#### Learning Skills in terms of Cognitive System

Table 2 shows the learning skills of the respondents which was evaluated in terms of cognitive system learning skill such as retrieval, understanding, analysis and knowledge utilization.

Data shows the overall cognitive learning skills of the respondents at the *fully mastered* level (M= 15.917, SD=

2.437). In terms of the level under this learning skill, it was found out that analysis (M=5.276, SD= 1.505) and knowledge utilization (M= 4.938, SD= 1.417) were fully the mastered skills; followed by understanding which was interpreted as "*moderately mastered*" (M= 2.317, SD= 0.991) and retrieval as "*nearly mastered*" (M= 3.385, SD= 0.969).

It was found out that analysis skill had the highest mean of 5.276 which means that respondents had fully mastered their skills in identifying the similarities and differences of different concepts in Chemistry subject. Followed by knowledge utilization skill with a mean of 4.937 which implies that the respondents have also fully mastered their skills in utilizing their knowledge for which obstacle exist in different situations.

Data further showed that retrieval skill was "*nearly mastered*" (M=3.385) of grade 9 students. This implies that the respondents were about to master their skills in determining the provided information of the topics in Chemistry. Understanding skill was "*moderately mastered*" of grade 9 students with the lowest mean of 2.31771. This implies that the respondents' ability to identify essential knowledge of concepts in Chemistry was average and that they are neither very good nor very bad.

**Table 2:** Learning Skills of students in terms of Cognitive System

Learning Skills in terms of Cognitive System	M	SD	Verbal Interpretation
Retrieval	3.385	0.969	Nearly Mastered
Understanding	2.317	0.991	Moderately Mastered
Analysis	5.276	1.505	Fully Mastered
Knowledge Utilization	4.937	1.417	Fully Mastered
Grand Total	15.917	2.437	Fully Mastered

#### Learning Skills in terms of Meta - cognitive System

Table 3 reflects the responses made by the respondents regarding their learning skills in terms of metacognitive system.

Results showed that meta - cognitive system learning skill of the respondents was *fully mastered* (M= 5.531, SD= 1.634). This means that the respondents had skills on decision making in which they evaluate the knowledge they gained in Chemistry subject.

**Table 4:** Learning Skills in terms of Self - system

Learning Skills in terms of Meta - Cognitive system	M	SD	Verbal Interpretation
Meta - Cognitive system	5.531	1.634	Fully Mastered

#### Learning Skills in terms of Self - System

Table 4 shows the responses made by the respondents with regards to their learning skills in terms self - system. Results showed that grade 9 students have "*fully mastered*" their self - system learning skill (M=5.765, SD= 1.651). It implies that the respondents have high level of skills in applying their knowledge in Chemistry to real life situation.

**Table 4:** Learning Skills in terms of Self - system

Learning Skills in terms of Self - system	M	SD	Verbal Interpretation
Self - system	5.765	1.651	Fully Mastered

**Teaching Strategies, Methods, and Techniques Used by the Science Teachers**

The 30 dimensions of teaching strategies, methods and techniques were ranked in terms of their means. Data in table 5 shows that 2 teaching strategies were *Always Used*, 22 were *Often Used*, 5 were *Sometimes Used* and 1 was *Never Used*. The first two strategies were interpreted as *always used*. The used of books and modules (M= 4.667, SD= 0.492) and the Use of charts, diagrams and tables (M= 4.583, SD= 0.515) were the *always used* teaching strategies, methods and techniques by the science teachers.

The top 5 *often used* teaching strategies, methods and techniques used by the science teachers were the following: Cooperative learning (M= 4.417, SD= 0.669), Interactive discussion (M= 4.417, SD= 0.669), Know - What - Learn strategy (M= 4.417, SD= 0.515), Indoor labs (M=4.250,

SD= 0.754) and Experienced - based environmental projects (M= 4.250, SD= 0.622).

The following teaching strategies were interpreted as *Sometimes Used*: Workshops (M=3.333, SD= 0.985), Game - Based (M= 3.333, SD= 0.985), Interview Method (M= 3.083, SD=0.793), Role Playing (M= 3.000, SD= 0.603) and Case Studies (M= 2.917, SD= 1.240).

Results further revealed that among the 30 teaching strategies, methods and techniques Fieldtrip method (M= 1.167, SD= 0.577) was *never used* teaching strategy, methods and techniques in Chemistry. This portray that 29 teaching strategies had been used by the science teachers at some time of their teaching career.

A study on factors associated with high school learner’s poor performance in South Africa classified the factors that led to poor performance - - - the direct influences which includes teaching strategies, content knowledge and understanding, motivation and interest, laboratory usage and syllabus non completion (Beloso, 1993).

**Table 5:** Teaching Strategies, Method and techniques used by Science Teachers

Teaching Strategies	M	SD	Rank	Interpretation
Use of books and modulels	4.667	0.492	1	Always Used
Use of Charts, diagrams and tables	4.583	0.514	2	Always Used
Cooperative learning	4.417	0.668	3	Often Used
Know what learn strategy	4.417	0.514	3	Often Used
Interactive Discussion	4.417	0.668	3	Often Used
Method				
Indoor Labs	4.250	0.753	4	Often Used
Experience Based	4.250	0.621	4	Often Used
Environmental Projects				
Scenario Analysis Base	4.167	0.717	5	Often Used
Teaching				
Process - based Learning	4.167	0.717	5	Often Used
Inductive Method	4.167	0.717	5	Often Used
Demonstration Method	4.167	0.717	5	Often Used
Guided Discovery	4.083	0.668	6	Often Used
Problems				
Discovery Approach	4.083	0.668	6	Often Used
Expository Teaching	4.083	0.668	6	Often Used
Project Based Learning	4.083	0.792	6	Often Used
Model based Inquiry	4.083	0.792	6	Often Used
Learning				
Peer Teaching	4.083	0.668	6	Often Used
Brainstorming	4.000	0.668	7	Often Used
Investigating Method	4.000	0.426	7	Often Used
Multimedia Teaching	3.833	0.852	8	Often Used
Process				
Team Teaching	3.833	0.834	8	Often Used
Reporting Method	3.833	1.114	8	Often Used
Film Showing	3.750	0.717	9	Often Used
Micro Teaching	3.750	0.965	9	Often Used
Workshops	3.333	0.984	10	Sometimes Used
Game Baed Learning	3.333	0.984	10	Sometimes Used
Interview Method	3.083	0.792	11	Sometimes Used
Role Playing	3.000	0.603	12	Sometimes Used
Case Studies	2.917	1.240	13	Sometimes Used
Fieldtrip	1.167	0.577	14	Never Used



### Relationship between Learning Skills and Academic Performance

Table 6 showed the relationship between the learning skills in terms of cognitive, meta - cognitive, and self - system and their academic performance in Chemistry. The result showed that there is a weak, positive but highly significant relationship between the cognitive system (N=192,  $r=0.317$ ,  $p=0.000$ ), meta - cognitive system (N= 192,  $r= 0.253$ ,  $p= 0.000$ ), and self - system (N= 192,  $r= 0.215$ ,  $p= 0.000$ ) learning skills of the respondents and their academic performance in Chemistry.

The results connotes that it is weak in a sense that the linear correlation coefficient takes values close to 0 but positive in a sense that each variable was directly proportional to each other. This implies that the more skills the students possess, the better they perform in the subject.

**Table 6:** The relationship between learning skills and academic performance

Learning Skills	Correlation Coefficient	Sig (2 - tailed)
Cognitive System	0.317	0.000**
Meta - Cognitive System	0.253	0.000**
Self - System	0.215	0.000**

\*\*Significant at  $p<0.01$

### 4. Conclusions

On the basis of the findings of the study, the following conclusions were drawn: Majority of the grade 9 students performed well in their Chemistry subject. However, there are still some students who need an improvement and a thorough guidance in learning the concepts in Chemistry. Based on this, the researchers conclude that the teachers are very good in teaching science subject especially in Chemistry; Students have fully mastered higher order skills but only moderately mastered the lower - level skills, such as retrieval and understanding. Based on this, the researchers therefore conclude that teachers gave more emphasis on teaching higher order skills than the lower - level skills with the assumption that students who mastered the higher order skills have also mastered the lower - level skills; There are varieties of teaching strategies, methods and techniques used by the science teachers which were generally effective in helping students utilized and improved their respective learning skills in Chemistry. It positively affects students in a sense that they performed well in the subject. As stated by Processing and Cognitive Enhancement program (2012) there are many factors that can affect the academic performance besides intelligence. King'aru (2014) cited that one of these factors is the direct influences which include teaching strategies, content knowledge and understanding, motivation and interest, laboratory usage and syllabus non completion, study habits; although the significant relationship between learning skills and academic performance is positively weak, yet they are still significantly related to each other. It is weak in a sense that the linear correlation coefficient takes values close to 0 but positive in a sense that each variable was directly proportional to each other. Therefore, the researchers conclude that the more skills they possess, the better they perform in the subject. This conclusion is in agreement with

the findings of Ramos, Dolipas, and Villamor (2013) when they pointed out that "the higher the level of higher order thinking skills of students, the better their performance in physics." Hence, the hypothesis was rejected; With results stated, it was then concluded that a lesson plan on retrieval and understanding levels of cognitive system will be developed to ensure the mastery of students in the said levels.

### 5. Recommendations

On the basis of the findings and information derived from the study, the following recommendations are offered:

Whenever possible, science teachers shall somehow give attention to the poor performers in the class and engage these students in activities that will unleash their learning skills in a particular area in order for them to perform better.

Moreover, the teachers shall also focus on the lower - level skills in spite of the "fully mastered" skills on the higher levels that the students have possessed in Chemistry, teachers should exert more efforts and do something in motivating students to learn to love and develop positive relationship towards Chemistry in order to maintain their skills because many have believed that students' relationship toward a subject affects their achievement in the subject.

In the same manner, teachers shall continue pursuing advanced studies to enhance their teaching capabilities, development of instructional materials and employment of teaching strategies.

Since there is a significant relationship between the learning skills and academic performance of the students, the researchers recommend that school administrators should support the sometimes - used strategies, methods and techniques stated in the results to provide adequate learning experiences for the improvement of students' learning skills to yield a better performance.

It is recommended that the science teachers must also be informed regarding the result of the study for them to evaluate and realize how science teachers performed and be aware of the teaching strategies, methods and techniques they are using. In the same manner, students are the most important element of the teaching - learning process. They should encourage themselves to actively participate in every classroom activity and to whatever teaching strategies the teacher is employing.

Parents should check the learning progress of their children especially at home and work closely to the teachers for the learning skills of their students.

Lastly, to verify the results of this study similar investigation is recommended. A study about the learning skills in relation to the other field of science should be conducted.

### References

- [1] Adeyemo, S. A. (2010). Background and Classroom Correlates of Students' Achievement in Physics. International Journal of Educational Research and

- Technology. Retrieved from [http://www.scirp.org/S\(vtj3fa45qm1ean45vffcz55\)/reference/ReferencesPapers.aspx?ReferenceID=1710334](http://www.scirp.org/S(vtj3fa45qm1ean45vffcz55)/reference/ReferencesPapers.aspx?ReferenceID=1710334)
- [2] Banas, M. A., Bornaes, C. D., & Teves, J. M. (2016). Teaching Strategies Used in Teaching Araling Panlipunan by Secondary School Teachers. Capiz State University (pp.24 - 30)
- [3] Bedwell, W. L. Salas E., & Fiore, S. M. (2011). Developing the 21<sup>st</sup> Century and Beyond Work Face: A Review of Inter Personal Skills and Measurement Strategies. Department of Psychology and Philosophy, University of Central Florida. Retrieved from [https://www.researchgate.net/publication/228814120\\_Developing\\_the\\_21\\_st\\_Century\\_and\\_Beyond\\_Workforce\\_A\\_Review\\_of\\_Interpersonal\\_Skills\\_Measurement\\_Strategies](https://www.researchgate.net/publication/228814120_Developing_the_21_st_Century_and_Beyond_Workforce_A_Review_of_Interpersonal_Skills_Measurement_Strategies)
- [4] Billones, R. D & Degones, R. B., (2010). Learning Difficulties Affecting Students' Performances in Mathematics. Capiz State University (pp.2, 12 - 15, 29 - 31)
- [5] Brown, P. C., Roediger H. L., & Mc Daniel M. A. (2014). Make It Stick: The Science of Successful Learning. Belknap Press. Retrieved from <http://www.hup.harvard.edu/catalog.php?isbn=9780674729018>
- [6] Burba, J. (2013). Gagne's Theory of Instruction: A Learning Theory. Retrieved from <https://julietausend.com/2013/05/06/gagnes-theory-of-instruction-a-learning-theory/>
- [7] Calmorin, L. P., & Calmorin, M. A. (2007). Research Methods and Thesis Writing Second Edition. Published and Distributed by Rex Book Store, Inc (pp.73, 101 - 104)
- [8] Casapo, H. A. (2006). Teaching Skills of Teachers and Students' Performance in Mathematics. Capiz State University (pp.5 - 11, 32 - 45, 66 - 71)
- [9] Collins Dictionary. (2017). Definition of Academic Performance Retrieved from <https://www.collinsdictionary.com/dictionary/english/academic>
- [10] David L. (2014) "Bloom's Taxonomy (Bloom), " in *Learning Theories*. Retrieved from <https://www.learning-theories.com/blooms-taxonomy-bloom.html>
- [11] Dean - Ziegler, J. (2015). Bloom's Taxonomy. Benjamin's Bloom Contribution to Education. Retrieved from <https://prezi.com/cahckzxixjz4/blooms-taxonomy/>
- [12] Durlak, J. A., et. al. (2011). A Meta - analysis of After - school Programs that Seek to Promote Personal and Social Skills in Children and Adolescents. American journal of Community Psychology. Retrieved from [http://www.flume.com.br/pdf/Durlak\\_A\\_meta-analysisof\\_after\\_school.pdf](http://www.flume.com.br/pdf/Durlak_A_meta-analysisof_after_school.pdf)
- [13] Fencl, H., & Scheel, K. (2005). Research and Teaching: Engaging Student's and Examination of the Effects of Teaching Strategies on Self - Efficacy course in a Non - majors Physics Course. Journal of College Science Teaching. Retrieved from <https://search.proquest.com/openview/afc69dab72d490712775a07941f1667e/1?pq-origsite=gscholar&cbl=49226>
- [14] Gatan (1991). Learning Science in High School: What is actually going? International Journal of Science Education. Retrieved from <http://www.tandfonline.com/doi/abs/10.1080/09500693.2013.823676>
- [15] Glossary of Education Reform (2016). 21<sup>st</sup> Century Skills. Great School Partnership. Retrieved from <https://www.edglossary.org/21st-century-skills/>
- [16] Higgins, S., Baum field. & V., Hall, E., (2007). Learning Skills and Development of Learning Capabilities. Report In: Research Evidence in Education Library. London: EPPI - Centre, Social Science Research Units, Institute of Education, University of London. Retrieved from <http://eppi.ioe.ac.uk/cms/Portals/0/PDF%20reviews%20and%20summaries/Learning%20Skills%20-%20Report%20-%20online2.pdf?ver=2007-01-25-101107-373>
- [17] Hoyle, R. H., & Davisson, E. K. (2011). Assessment of Self - regulation and Related Constructs: Prospects and Challenges. Retrieved from [http://www7.nationalacademies.org/bota/21st\\_Century\\_Workshop\\_Hoyle\\_Paper.pdf](http://www7.nationalacademies.org/bota/21st_Century_Workshop_Hoyle_Paper.pdf)
- [18] Intel Education Initiative (2012). Marzano's New Taxonomy. Intel Corporation. Retrieved from <https://www.intel.com/content/dam/www/program/education/us/en/documents/project-design/skills/marzano-taxonomy.pdf>
- [19] King'aru, J. M., (2014). Students contributing to Poor Performance of Science Subjects: A case of Secondary Schools in Kawe Division, Kinondoni Municipality. Retrieved from [http://repository.out.ac.tz/598/1/JAMES\\_MUCHWE\\_KING%E2%80%9DAR\\_U\\_Final\\_Thesis.pdf](http://repository.out.ac.tz/598/1/JAMES_MUCHWE_KING%E2%80%9DAR_U_Final_Thesis.pdf)
- [20] Larson, L. C & Miller, T. N (2011). 21<sup>st</sup> Century Skills: Prepare Students for the Future. Unite Kingdom: Kappa Delta Pi Record. Retrieved from <http://www.tandfonline.com/doi/abs/10.1080/00228958.2011.10516575>
- [21] Learnovation (2009). Inspiring Young People to Become Lifelong Learners. Retrieved from <https://hal.archives-ouvertes.fr/hal-00593007/document>
- [22] Marzano & Krathwohl. (2007). Taxonomy of Educational Objectives. The Classification of Handbook I: Cognitive Domain. Retrieved from <http://thekglawyerblog.com/ptblog/articles/from-bloom-to-marzano-a-new-taxonomy-of-educational-objectives-for-plt/>
- [23] Marzano, R. J. (2000). Designing a new taxonomy of educational objectives. Thousand Oaks, CA: Corwin Press. Retrieved from <http://www.learntechlib.org/d/26543>
- [24] Marzano's New Taxonomy (2007). Designing effective Projects: Thinking Skills Frameworks. Retrieved from <http://weetwatjemeet.slo.nl/documenten/Bijlage-Marzano.pdf/>
- [25] Merriam - Webster Dictionary (2017). Definition of Analysis. Retrieved from <https://www.merriam-webster.com/dictionary/analysis>
- [26] Movahedzadeh, F., (2011). Improving Students' Attitude toward Science through Blended Learning Department of Biological Sciences, Harold Washington College. Retrieved from <https://d32ogoqmyal1dw8.cloudfront.net>

- net/files/seceij/summer11/movahedzadeh\_. pdf. v2. pdf
- [27] National Research Council (2011). Assessing 21<sup>st</sup> Century Skills. Summary of Workshop, Washington DC. National Academy of Sciences. Retrieved from [http://sites.nationalacademies.org/dbasse/bota/topics/dbasse\\_071496](http://sites.nationalacademies.org/dbasse/bota/topics/dbasse_071496)
- [28] OECD (2010). Learning in the 21<sup>st</sup> Century: Research Innovation and Policy. Directions from recent OECD analysis. <http://www.oecd.org/site/educeri21st/40554299.pdf>
- [29] PACE (2012). Processing and Cognitive Enhancement: Hands - On Learning Solutions for Effective Learning Skill. Retrieved from <http://www.hol-solutions.com/services/pace/>
- [30] Pittser, B., (2017). Bloom's taxonomy & 21<sup>st</sup> Century Skills, West Washington Avenue: Filament Games. Retrieved from <https://www.filamentlearning.com/blog/blooms-taxonomy-and-21st-century-skills>
- [31] Ramos, J. L. S., Dolipas, B., Villamor, B., (2013). Higher Order Thinking Skills and Academic Performance in Physics of College Students: A Regression Analysis. Benguet State University: International Journal of Innovative Interdisciplinary Research. Retrieved from [https://s3.amazonaws.com/academia.edu/documents/44521473/HOTS.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1517859492&Signature=1W6jkNnHrtWVbg51c68yaFVNrKQ%3D&response-content-disposition=inline%3B%20filename%3DHigher\\_Order\\_Thinking\\_Skills\\_and\\_Academi.pdf](https://s3.amazonaws.com/academia.edu/documents/44521473/HOTS.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1517859492&Signature=1W6jkNnHrtWVbg51c68yaFVNrKQ%3D&response-content-disposition=inline%3B%20filename%3DHigher_Order_Thinking_Skills_and_Academi.pdf)
- [32] Redecker, C. & Punie, Y., (2013). The Future of Learning 2025: Developing a vision for change. Future Learning, Vol.1. Retrieved from [http://www.academia.edu/6470910/The\\_Future\\_of\\_Learning\\_2025\\_Developing\\_a\\_vision\\_for\\_change](http://www.academia.edu/6470910/The_Future_of_Learning_2025_Developing_a_vision_for_change)
- [33] Rogers & Ford (1997). Improving Students Attitudes Biology. University of California. Retrieved from [https://www.jstor.org/stable/4448546?seq=1#page\\_scan\\_tab\\_contents](https://www.jstor.org/stable/4448546?seq=1#page_scan_tab_contents)
- [34] Sharma, L. (2017). Designing Effective Projects: Booster for PSFTT & CTET Exams. Retrieved from [http://www.dailypioneer.com/getmainfile.php?filename=epaper-ChandigarhEnglish-Edition\\_11-09-2017.pdf](http://www.dailypioneer.com/getmainfile.php?filename=epaper-ChandigarhEnglish-Edition_11-09-2017.pdf)
- [35] Siwel, Y. (2008). Students References on Science Subject: Does this Affect their Performance? Retrieved from [http://ejournalofsciences.org/archive/vol2no8/vol2no8\\_11.pdf](http://ejournalofsciences.org/archive/vol2no8/vol2no8_11.pdf)
- [36] Smith, R. M (1982). Learning How to learn: applied Theory for Adults. New Jersey, United States: Prentice Hall. Retrieved from <https://www.bookdepository.com/Learning-How-Learn-R-M-Smith/9780842822046>
- [37] The National Academies Press (2012). Education for knowledge and skills in the 21<sup>st</sup> century. Washington DC: National Academy of Sciences. Retrieved from [http://sites.nationalacademies.org/dbasse/bota/topics/dbasse\\_071496](http://sites.nationalacademies.org/dbasse/bota/topics/dbasse_071496)
- [38] Thought Co. (2010). What Is Chemistry? Definition and Description. Retrieved from <https://www.thoughtco.com/what-is-chemistry-602019>
- [39] Thoughtful learning (2012). What are Learning Skills? Retrieved from <https://k12.thoughtfullearning.com/FAQ/what-are-learning-skills>