

Enhancing Creative and Critical Thinking Skills of Secondary Students

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Abstract: *Sir William Bragg once said, “The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them.” Given that there are so many endless ideas, since this is a world where curiosity is planted, but still we can’t deny the fact that we just end up being ultimately curious about things. Bragg said that there is a need to discover new ways of thinking about science. But what needed the most is the facilitator, the facilitator who can be of big help in organizing facts and can be the bridge to invent new ways of understanding science. The teachers, the facilitators, the educators are the most needed to help learners understand so much of the world, to understand science. “It is the supreme art of the teacher to awaken joy in creative expression and knowledge.” This is a quote from Albert Einstein, which tackles the purpose of the teacher. In line with this, Science is one of the very complex subjects that is being taught nowadays where effort is necessary to catch the interest of the learners. Teaching of science is not just a big challenge to the teachers, but also, it is a point of responsibility, since the educators’ duty is to make students learn like learning to count or to read, learning this substance is also a lifelong process, basically because it is a big part of individuals’ everyday life. It is the schools’ concern to help their teachers sharpen students in science, especially because the reality that awaits the learners is everything about science. Besides, it is anticipated that science curriculum of a state is capable of aiding scientific manpower not undermining the truth that it echoes the essentials, ethics, welfares and goals of the society. In public secondary schools, science teaching is no joke since large number of students in the Philippines are said to be studying in Public or Government schools. Due to fast tracking time, the present quickly reached its saturation point, and there were lots of changes occurred in the realm especially in the educational system. The country, feasibly, is going along with the transformations of the world. Teaching science in public secondary schools is one of those greatly affected areas in education. Subsequently there were studies saying that science secondary education in the Philippines lags behind other countries in the world. It turns out that teachers together with the education sector of the country must strive harder to escalate the state’s science education, particularly in public schools. The focus of this study was to describe the creative and critical thinking skills of junior high school students as assessed by teachers and students themselves. The descriptive method of research was applied in the study, with the questionnaire as the main data gathering instrument responded to by 71 science teachers and 369 students along the public secondary schools in Batangas City. From the teachers’ assessment in creative thinking skills, the highest weighted mean is application of distributed reasoning or brain storming in the context of cooperative groupings which obtained 3.27 weighted mean and verbally interpreted as greatly manifested. While from the students’ assessment, the results revealed that they greatly manifested extension of one’s idea to a concrete outcome by applying learned concepts and principles which obtained 3.39 weighted mean. From the teachers’ assessment in creative thinking skills, making unusual association or connections between seemingly unrelated or remote ideas were the lowest mean scorer of 2.97, manifested. On the other hand, in students’ assessment the lowest weighted mean is making unusual association or connections between seemingly unrelated or remote ideas and is manifested by students with a weighted mean of 3.04.*

Keywords: creative thinking, critical thinking skills, science, junior high school students

1. Introduction

“Science is a magic without lies.” It’s not just a systematized body of knowledge and a fruit of curiosity, it is something that can unleash what lies on the past and can be a prophecy of future. It is more than magical in a way that it can be used to surmount nature’s force and give man a super power to manipulate his surroundings. Science is the root of our existence for it explains our origin and is able to trace the footprints of the past. It gives meaning to our structural being, from anatomy and physiology up to genetic mutation and man’s evolution. It also clarifies the existence of blue eyes and answers the question “why the sky is blue”, even the chemical explanation in a situation when a person’s in blue. Science is something that is very essential to human being since, they are by-product of science, and it is a must in people’s everyday survival. In short, it is more than the existing galaxies, because Science is beyond everything.

A world without science will be a world of unending questions with unsupplied answers. Its existence is also the birth of discovery, understanding and knowledge. The magic of it deals with the different realistic laws, theories and inventions that are permanently changing. It can answer the

“WH” questions in our daily life. It can also be the root of many more questions once an answer popped out, for science never solves a problem without creating ten more. The good thing about science, unlike magic tricks, is that it’s true whether or not you believe in it. Creativity is a skill that can be learned, it gives power to people by exerting force to their natural abilities that may result to great teamwork, productivity, and profits. It is beyond thinking outside the box. The essentiality of this thinking skill, once enhanced, is that it can support the learners in thinking differently whenever they met problems that require creativeness and it can qualify students to see what everybody else has seen but think in a way that nobody else has thought.

With creative thinking skills, there also comes critical thinking skills where students are expected to be taught thinking by themselves, evaluating evidences, making decisions and later, making contradiction on something that has been already proven. It is helping the learners to come up with a way to fix mistakes that somehow direct them into thinking creatively and critically. It is somehow encouraging the students to invest in knowledge and seek for more answers and create new questions afterwards. These two thinking skills are just a dot in the picture but it can greatly affect science education in the country to level up and go

Volume 8 Issue 6, June 2019

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along with the other successful countries when it comes to science. Creative and critical thinking skills are needed very often in learning and science together with the fact that it has so many topics that greatly deal with the need to use and utilize creative and critical thinking skills. Science, itself, is such a very complex subject that come along with so many confusions and controversies, lots of problems to solve and things to innovate and it only takes a creative and critical thinker to contradict such wrong beliefs and innovate new ways of understanding science. That's why it is in the teachers' hand on how they are going to enhance these two special thinking skills of the students.

2. Materials and Methods

The respondents of the study are the 376 junior high school students of different grade levels and 71 science teachers in the selected schools in Batangas City. The researchers selected the school through random sampling. The sampling strategy used was based on the availability of technology-based instructional materials to schools understudy.

3. Results and Discussions

Creative and critical thinking skills are important in students' learning because these thinking skills promote efficiency in students' learning outcomes. Through these two thinking skills students can achieve all the goals set for their learning as they developed to become competent and productive individuals. Creative and critical thinking skills are the major skills that require enhancement and empowerment to attain the objectives of the education sector.

Items	Teachers		Students	
	WM	VI	WM	VI
1) Extend ones idea to a concrete outcome by applying learned concepts and principles.	3.11	M	3.39	GM
2) Make unusual association or connections between seemingly unrelated or remote ideas.	2.97	M	3.04	M
3) Often concerned with adapting improving and modifying existing ideas, thoughts or outcomes of others.	3.23	M	3.27	GM
4) Apply distributed reasoning or brain storming in the context of cooperative groupings.	3.27	GM	3.31	GM
5) Generates alternative ideas, practices and solutions that are unique and effective.	3.18	M	3.27	GM
6) Imagine multiple ways to investigate the complexity in a phenomenon.	3.14	M	3.07	M
7) Make up stories to explain a complicated topic or situation.	3.14	M	3.19	M
8) Break down big problem into smaller ones, formulate question, predict possible answer and devise ways to test those answer.	3.18	M	3.16	M
9) Exhibit intense curiosity once the teacher discusses a new lesson and frequently ask question.	3.15	M	3.17	M
10) Show rare capacity for originality when completing special or unusual projects.	3.11	M	3.09	M
Composite mean	3.15	M	3.2	M

Legend: GM- Greatly Manifested SM- Slightly Manifested M- Manifested

Of the ten skills of creative thinking, applying distributed learning or brain storming on the context of cooperative groupings was greatly manifested by the junior high school students as given by the highest weighted mean of 3.27 as assessed by the teachers. Finding indicates that the students are fond of exchanging ideas to one another and working as a group is substantial for them to think creatively. This affirms the report of Sawyer in his book, that to be able to come up with a creative idea, one should collaborate from a group of diverse individuals coming from different fields because distant analogies lead to new ideas aided by group brainstorming.

This skill is followed by adapting, improving and modifying existing ideas, thoughts or outcomes of others which were manifested by the students as reflected from the weighted mean of 3.23. Such attainment implies that students are particular with the works of other people, where they can connect the existing ideas that they have. This could mean that through adapting to the outcome of others, they can creatively think of a more developed thought and brighter ideas.

Regarding the skills in generating alternative ideas, practices and solutions that are unique and effective, this was manifested by the students and gained a weighted mean of 3.18. Such practice of the students could mean that when students find out that the old and common ways of solving a problem are no more effective, they hunt for substitute and new way of answering, they create fresh ideas and perform unique applicable practices that are suitable on their current situation. This conforms to the findings of Supriyanti et.al, wherein the students fostered creative thinking skills by innovating the local material chemicals. Local material based experiment (LMBE) approach guided the students in designing experiments and constructing ideas in utilizing the local materials and inventing materials and altering new experiment.

Breaking down big problem into smaller ones, formulating questions, predicting possible answers and devising ways to test those answers also gained a weighted mean of 3.18 as assessed by the teachers. Such attainment is an indication that the students manifest this creative thinking skill. Hence, it is evident that they are focusing on the specificity of a matter for them to be able to answer and formulate questions while gaining the power to predict and check possible answers. This conforms to the explanation published in <https://www.sparringmind.com> that creative thinkers are those who re-conceptualized generic problems through examining it from another angle and focusing on a far better fundamental part of the problem to achieve other goals by coming up with something more original.

Still on the verbal description of manifested but is in the lower bracket of weighted mean is the skill in making unusual associations or connection between seemingly unrelated or remote ideas. This acquired a weighted mean of 2.97 which means that students unveil creativity the moment they draw connections between contradictory things or ideas or simply when they make linkages between two different

matters. This findings support the propositions of Michalko that creative thinkers have the ability to generate associations and connection between dissimilar subjects. To be able to make things familiar, they must look into unfamiliar.

The skill in extending ones ideas to a concrete outcome by applying learned concepts and principles also belongs to this lower category of weighted mean. It garnered a weighted mean of 3.11. This manifested skill of the students implies that they are said to be creative if they have the ability to apply the past concept and principle they've learned into their new learning experiences. The importance of this skill was emphasized by Sawyer in his book where he mentioned that ideas don't magically appear in a genius' head from nowhere. They are created from the pre-existing ideas mixed with the new one. In order for students to think of a better idea, one should always look back on the previous lesson and knowledge and connect these to present situations.

Showing rare capacity for originality when completing special or unusual projects achieved is also a skill that is manifested and belongs to the lower bracket of weighted mean. It attained a weighted mean of 3.11. Such attainment denotes that students present rare thirst for uniqueness. This only means that students are being contented on simple ideas and they already lost the skill to think creatively. It is exhibited by the students because they are lacking the motivation to do work and to strive harder. Some are not highly encouraged to give their best that's why they turned out to be contented on the simplicity and dullness of their works.

Overall, the 10 creative thinking skills in science, from the teachers' assessment, were manifested by students as given by the composite mean of 3.15. Result reveals that the junior high school students are displaying creativity in the class discussions and tasks. However, there is still a need for teachers to give more emphasis in a more engaging and interesting classroom tasks and activities that can uplift the mood of the students and encouraged them to do things creatively. There should be proper motivation and unending trust on the part of the teachers towards the student. This conforms with the idea of Richmond that mere expectation of being judged tends to reduce creativity, personal feedback could actually enhance creativity if it was the right kind, that is, feedback that helps a person do what he or she compelled to do is effective. Even the prospect of direct rewards, normally suffocating to creativity, could be helpful if they were the right kinds of rewards. As such intrinsic motivation is still best, and extrinsic motivation that's controlling is still detrimental to creativity, but extrinsic motivators that reinforce intrinsic drives can be highly effective.

Proceeding to the other side of the table, the students' assessment of themselves, extending ones idea to a concrete outcome by applying learned concepts and principles were greatly manifested by the students. It obtained a weighted mean of 3.39. It can be concluded from this that this students' creative thinking skills are prompted whenever their learnings from the past are required to be applied on a new concepts or sets of ideas.

This skill is followed by the application of distributed reasoning or brain storming in the context of cooperative groupings which garnered a weighted mean of 3.31. The students greatly manifest these skills. It can be clinched that students expresses creative thinking in a manner that they work together and parts ideas with others. The swapping of concepts, perhaps, is their way of framing first-hand thinking and being in cooperative groupings brings out their inventive sides. This contradicts the belief of Cain, where she discussed in her book that working alone is better than working in groups in terms of productivity and creativity. Personality has a big impact on being creative. Many creative people are introverted, extremely sensitive, shy and may be inhibited in shared groups, especially when there is a pressure to emanate needed ideas on the spot.

This was followed by the two skills that the students' greatly manifested, these are adapting, improving and modifying existing ideas, thoughts or outcomes of others and generating alternative ideas, practices and solutions that are unique and effective. These two gained a weighted mean of 3.27. This is an indication that students think creatively whenever an existing ideas of other people come to the need of adjustments, development and revisions. The work of others plays a vital role in making the creative thinking skills of students work. This supports the article published in mindtool.com where it emphasizes that standard idea-generation techniques concentrate on combining or adapting existing ideas. The ability to generate new ideas is an essential work skill today. One can acquire this skill by consciously practicing techniques that force the mind to forge new connections, break old thought patterns and consider new perspectives. There is a need to adopt enabling strategies too. These enabling strategies help in creating a positive atmosphere that boosts creativity.

However, it can also be observed from the assessment of students that the skill which garnered the lowest weighted mean of 3.04 and is manifested by the students is making unusual connections between seemingly unrelated or remote ideas. It can be further decided that the students showcase their creative thinking skills by means of networking ideas that are not fully related. It is a showcase of how a creative thinker make impossible to possible by simply relating the unrelated ideas. This affirms the stand of Doyle where she defined creativity as looking at something in a new way. It is the very definition of "thinking outside the box." Often, creativity in this sense involves what is called lateral thinking, or the ability to perceive patterns that are not obvious. The fictional detective Sherlock Holmes uses lateral thinking in one famous story when he realizes that a dog *that is not* barking is an important clue in a murder case.

Imagining multiple ways to investigate the complexity in a phenomenon gained a 3.07 weighted mean. This means that the students manifest this skill. Simply, creative thinkers' students are bound into discovery. They seek for various means of examining a particular occurrence and its complications. Students nowadays are very imaginative and minds are always full of new ideas. A phenomenon will always make them curious and could be the avenue for them to find conflicts. In here, they became discoverers of

conflicts which at the end could be resolved through their creative thinking.

Showing rare capacity for originality when completing special or unusual projects and accounts garnered a weighted mean of 3.09. This thinking skill is manifested by the students. Technically, students' main responsibility is to make one of a kind and original outcomes in the school but the rareness of this attitude has been exhibited. This is an implication that the creative thinking skills of the students are still lacking and not yet widely used.

Overall, the 10 creative thinking skills in science, from the students' assessment of themselves, were manifested by students as given by the composite mean of 3.2. Results reveal that the junior high school students are using these creative thinking skills. Despite of this, results had shown the need for a more effective way of helping the students bring out their creativity in school's tasks and activities.

4. Conclusions & Recommendations

The students rarely make unusual associations or connections between seemingly unrelated or remote ideas. Meaning to say, learners are not that oriented in interconnecting knowledge – which, according to Epstein, displays essentiality in creative thinking. The critical thinking skills inhabit 21st century learners. Science teachers boost their students' creative and critical thinking skills through investing students into research with a contextualized learning experience that truly allow the students to enhance their thinking skills with a moderate extent. They also use paired students strategies, reading and they even challenge students to make a different solutions from problems, wherein their thinking skills can be boosted also with a moderate extent but not as intensify as that of the first three (3) items. This is a clear implication that the science teachers of today enrich students thinking skills in a more realistic and application-friendly way.