

## **Productive Methods of Teaching Middle School Science**

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**ABSTRACT** : *The aim of this research was to examine the productiveness of productive methods teaching learning in middle school science. According to researcher (2014), the productive science method allows students to actively explore science ideas through experiments, personal projects, and laboratories that are guided by the teacher. The participants were in a seventh standard in government higher secondary school, Peruvallapur, Trichy-district, Tamil Nadu, India. The research focused on a productive buoyancy unit that was taught over the course of a week. The majority of students' grades drastically increased between the pre and post test after completing the unit. The results indicated that students' enjoyed learning through the productive method of teaching. The productive buoyancy unit was a success in this classroom and the majority of students' wanted to continue to learn science through productive methods and projects.*

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### **I. INTRODUCTION**

Learning science in middle schools helps students to develop problem solving skills and critical thinking skills. However, the science curriculum needs to be strengthened in so that it encourages students to more actively explore their environment. The world is changing and science is central to the curing of diseases and solving world problems like global warming. Students need to learn the skills to become scientist or just think critically in everyday situations. Currently science curricula in middle schools are failing because teachers and students become discouraged with science because of the emphasis on math and literacy testing, and science gets pushed aside for those content areas. Students' interested to produce innovative things related what they learned in science but teachers' not give importance due to changing of education system. As a future educator, I was interested in looking at productive ways of teaching science that help the students learn and become interested in science. This review examines number of different studies that help answer the question: How do middle school students learn science most productively in the middle school classrooms?

The research related to this topic discusses different ways of teaching science to middle school students and just how productive these methods are. The review examines many educational journal articles on this topic. The articles are sorted by the method of teaching that are being discussed and factors that affect science teaching. The methods discussed are cooperative learning, science inquiry, and science integration. The final section of the review, discusses factors that affect science teaching such as socio-economic status, culture, and gender differences. The science teaching methods will be analyzed in order to try and understand what ways of teaching science are most beneficial to the student. Researcher explores the productive teaching method in relation to teaching middle school science. The productive method believes in using students' prior knowledge to learn new materials. The theory also believes that students should be actively building their knowledge through productive activities that are student-centered. When the researcher study used two groups of 13 year olds that were studying biology, one group received instruction based on the traditional teaching method and the second group received instruction based on the productive teaching method. The study showed that the productive method promoted higher order thinking and that students learned the material more thoroughly. The study also indicated that there were fewer differences between the higher achievers and lower achievers when they learned with the productive method. In the productive method, the higher and lower achievers also scored better overall on assessments. The productive groups were able to better save the information after the lesson, both in terms of the depth within their cognitive structures and the degree of concept. Students also improved their abilities to describe and predict or explain. The studies by researcher (2004) shows that students who learned through the productive approach were able to link the information better and therefore remember the teachings after the instruction. The study did not find any advantages to the traditional method when compared to the productive approach. The productive approach is one method that teachers can use to help students learn science better and develop higher order thinking.

**Productive methods of Science** :Productive science methods allow students to explore science ideas through experiments, personal projects, and laboratories that are guided by the teacher.

After finished the lesson's students can produce the simple models, working models, preparing specimens, writing scripts, writing songs and various productions. (Paris et al., 1998) The students are active in their own education and the teacher is there to support and facilitate learning. I provided facilities and I found that the productive approach to learning science was effective in boosting students' attitudes about science. After completing six weeks of productive on biology, the eighth standard students, were more interested in science not only in school, but in real life. Students were more willing to go to museums and work on science projects outside the classroom. The program was also beneficial to girls who are often seen as being uninterested in science. After doing productive on science, girls became more interested in science and many of the girls' scored better than the boys on the posttests. The study also showed that students improved their problem solving skills, received better grades, enjoyed working together, and become independent learners. Researcher directly seen the productive on science is beneficial to the students and not only helps students learn, but also increases their interest in science. The study did not find any disadvantages to using the productive teaching method. Students in the study improved their science skills and grades by using productive learning. The productive on learning strategy is just one method that can be used to teach science in middle school classrooms.

Productive learning is a method in which students work in groups to teach each other the information and are guided by their teacher. The students become the teachers and are just directed by their actual science instructor. The goals of productive learning are to "develop students' social and communication skills, increase tolerance and acceptance of diversity, and improve academic achievement". According to researcher the research shows that this method promotes better relationships, higher order thinking, problem solving, and achievement. It has also been shown that students retain the information better when they have taught other students. Further, researcher believes that the productive learning method is beneficial in teaching science and should be used by all teachers. Students were placed into one of three types of groups; a group who used the jigsaw method, a group using jigsaw with supplementary questioning training, or a teacher-guided group. The jigsaw method is defined as students placed in groups where each student chooses one sub-topic to learn about and to report on back to the larger group. Students who have chosen the same sub-topic meet to study their material and then go back to their original group and each student teaches their group what they have learned. The researcher found that third graders learned best when they were placed in the teacher-guided group which only used 4percent of its time on group work. The achievement gains for the students in the jigsaw group were rather small. The study implicates that this productive teaching method may be too advanced to use with younger students. One reason for the lack of progress with the jigsaw groups could have been due to the fact that the teachers were not supposed to intervene in the jigsaw groups or guide these groups. In the productive learning with the teacher being there to guide the students and step in when needed. This could have been the reason that cooperative learning was unsuccessful with the third graders. The productive learning would be successful in the middle school classroom. More research done by researcher and find out the productive teaching in middle school science increased students interest. Especially since this method is usually used alongside inquiry science because interacting in peers groups and discussing ideas is a key part of inquiry science. Children's literature is a tool that science teachers can use to teach science concepts and vocabulary in a more interesting and motivational way (Barclay et al., 1999). Many teachers believe that they do not have time to teach science because curriculums have become centered on literacy. Teachers can use science books to not only teach science concepts, but to foster emergent literacy in middle school students., Further this researcher states that using literature in science will help them develop important science concepts and become competent readers. He believes that "children's books serve as a natural springboard for exploration of science-related topics".

**Productive method for Writing :** This research is teaching method to see if productive writing in science helps students think critically and understand the subject matter. When the students produced models then he write about the model, for these activities to help understanding of subject concept, and also to develop the students' critical thinking. This research found that the productive writing helps to learn and helps students learn as long as they know how to effectively write in their notebooks. When students do not know how to properly use this technique it is no longer an effective method of teaching science. The students who brainstormed, searched text, and searched experiments were able to think critically and learn through writing. In a similar study, Baxter et al. (2001) examined how effective notebook writing was in science classes. The research found that notebook writing can help facilitate science learning as long as the writing is purposeful and relevant. Both studies show that writing in science can be useful to elementary students as long as students are taught proper writing strategies. Baxter et al. (2001) believes that "notebooks or other forms of writing can facilitate teaching and learning in the science classroom if teachers harness the power of purposeful recording and thoughtful reflection about one's work".

This method of productive writing to learn science can be beneficial and can go alongside productive learning. The studies by research that productive learning is effective for learning science so the two could go together. Productive learning can take place in conjunction with writing. Students can keep notebooks that they can use to facilitate their learning. The teacher can give writing active like speaking to various plants and animals it will help to students writing skills.

**Productive method for Mathematic :** Teaching science and mathematics together can allow for teachers to successfully incorporate science into a curriculum that is based around standardized math and language arts tests (Furner et al., 2007). According to Furner et al. (2007), “research indicates that integrated curriculums provide opportunities for more relevant, less fragmented, and more stimulating experiences for learners (p. 2)”. The integration of these two subjects can bring together overlapping principles and concepts in a way that is meaningful to students. Students would also be able to better solve problems because they will better understand the context in which the problem is embedded (Furner et al., 2007). Furner et al. believes that integration will motivate students and increase involvement. A study by Leonard et al. (2006) found that when they integrated mathematics into a lesson on space the students were more motivated and enjoyed the lesson. Leonard et al. (2006) found that the integration of math and science “allows teachers and students the flexibility to participate in investigations, simulations, and inquiry, as well as address issues of time management” (p. 1). Integrating mathematics into science can help the students become engaged and interested in both subjects especially when done through productive science. Both articles found this method of teaching beneficial to students learning and helpful because it allows teachers to spend more time on science which is often lost by a curriculum dominated in math and language arts. This method is also motivational to students and allows them to understand concepts of math in real life situations and problems. Both articles indicate that integrating math and science is a good teaching method that should be used whenever possible.

**Productive method and Technology :** Another method for learning science is using the web to teach lessons and explore ideas. Wallace et al. (2000) researched the effectiveness of learning science by students going online to discover information. Students were able to research scientific topics online. In this study, using the internet to learn science was found to be unproductive. There were many reasons that this method of teaching was unproductive. Students had trouble using web tools because they are not yet designed to support learning. Reading online was also difficult for students so they often skipped material and read as little as possible. The research found that students rarely read information that they found interesting because it was too difficult. The science content available online was often “unpredictable, changing, and sometimes hard to find” (Wallace et al., 2000, p.25). The researchers found that upper level elementary students struggled with using the internet to learn science. When tasks were made for students that would allow them to explore and pursue questions of interest the students often just saw the assignment as doing school work and they did not enjoy the task. The study showed that using the internet as a method of teaching is extremely complex and does not benefit the students’ learning. Students struggled with learning when presented in this way. Using the internet to learn concepts of science can be seen as one way of learning through exploration. Web based research allows the students to investigate their own topics and not just be lectured or taught at. Unlike productive learning though, this method of teaching does not seem to be effective in teaching students science.

**Productive method for Rural Schools :** The teaching method is not the only factor that effects science education for middle school students. The social-economic status of the area in which the school is located can also affect science education. O’Hare (2006) discusses the gap between rural science and urban science education. One third of Indian school children attend schools in a rural area. The schools therefore lack many of the resources to teach effective science. According researcher, the major disadvantage rural schools have is that they attract less qualified teachers with one in four science teachers lacking in proper certification. The effects of this is that teachers are unable to teach science education and do not receive professional training from the schools because of lack of funds. Researcher found similar reasons why science education was not as effective in rural schools. These factors include, “low fiscal capacity, greater per pupil cost, teachers teaching outside their specialty area, less competitive salaries, less specialized space and equipment, less planning support services”. The program works at training teachers to use interactive strategies in the classroom. According researcher, professional development is needed because in order for the students to learn the teachers must continue to learn. The productive teaching techniques are one approach to change the science education in rural areas that have a unlock of resources.. The school education department also worked on changing the curriculum to make it more interactive and specific so teachers knew what they should be teaching. The program has shown to be effective in raising students’ science scores on tests and the teachers feel more empowered to teach science in the classroom.

Researcher says that not all the schools have changed their curriculum though and the program still faces challenges of sustaining the changes that they have made. The researcher found that science education is lacking in rural areas of Tamilnadu, India, but with professional training, productive teaching techniques in rural schools can effectively teach science.

**Productive method for Student's Motivation :** Teachers need to be prepared to teach, but students also need to have a willingness to learn science. A study by Patrick et al. (2008) changed the science curriculum to integrate science and literacy activities in a Kindergarten classroom. Patrick et al. (2008) believes that teaching science in a fun and effective manner will increase students' motivation to learn science. In the study, he found that students who participated in this form of science held positive motivational beliefs and thought that science was easy, they were good at it, and that they liked science (Patrick et al, 2008). The students who had the most positive experience found that they had received positive support from their teachers and very few negative conflicts. The students with the least motivation reported less supportive interactions or more non-supportive interactions with their teacher. Patrick et al. (2008) believes that positive teacher-child interactions are important in science education in order to keep their motivation and liking of science. The study shows that the type of instruction is not the only important factor in science education, but also the relationship between the student and teacher. House (2008) conducted a similar study to find out what factors effected how elementary students perceived science. The results showed that students who had higher test scores had more positive beliefs about science and students with low test scores held negative beliefs about science (House, 2008). According to researcher productive teaching learning methods were found effective in increasing students' positive attitudes about science because students' monitor their own progress and can get help for solving the problems. The study shows that teaching methods are not just important because of how they learn, but also in motivating them. Students need to have positive attitudes about science in order for them to want to learn.

**Summary :** Science education is lacking in elementary and middle schools. This paper looked at various peer reviewed articles and researcher own experience on science teaching methods to try and answer the question of what ways of teaching science are most beneficial to the students. The articles were sorted by the method of teaching that were being discussed and factors that affect science teaching. The methods that are talked about are productive teaching learning, by various aspects. The last section, discussed factors that effect and affects science teaching like socio-economic status and motivation. The research shows that some of these methods are helpful to learning science and others are not as beneficial.

## **II. METHODOLOGY**

Can students learn science better through productive learning or traditional teaching methods in the middle school Classroom? Science curricula need to be examined in order to find more interesting and successful ways of teaching science. Many teachers have let the science curriculum receive less instructional time because they are concentrating more on math and language arts because of standardized tests. We live in a technology based world, but yet science education is frequently lacking. Science teachers need to be able to teach in effective and engaging ways so students receive appropriate quality and quantity of science instruction. This study focused on the examination of productive teaching learning to see if it makes science more interesting and easier to learn for elementary and middle schools students.

**Participants :** The study was conducted in a seventh standard classroom in rural schools. There are a total of 45 students in the class with 27 females and 18 males. The teacher has said that this is the widest range of students that she has ever had with many students able to read at a middle school level and others only reading at a first grade level. Six of the students are considered below average readers and receive extra help. The teacher instructed to make things and write on product concern and present in class. This study is action research. It was designed around the productive science curriculum. The teacher was familiar with the program and wanted to see how well the students did with this unit. The study utilized action research methodology because it was conducted in a naturalistic setting and sought to solve the problems of lack of effective science education in the classroom. The students were taught the unit by their host teacher who had some experience with teaching through the productive method. The action research that was done was important because it helped the host teacher increase and improves science instruction in the classroom.

**Procedure :** The researcher class started a new lesson on buoyancy. The students received a pre-test prior to starting the unit. The pretest came from the teacher's edition of their science book and from questions researcher made up because they were concepts she wanted the students to understand. The grades were recorded under the students' number. The unit started with the host teacher using the productive activity kit on buoyancy. The students usually receive instruction through the traditional method of taking notes on the subject being taught.

The first day's lesson was learning about the shapes of boats and how this affects buoyancy. The students were taught about shape and they were given an activity to test it out. The students made clay boats to show that some boats sink easier than others because of their shape. Before the lesson began, the students had to predict what they believed would happen to boats of different shapes. After the activity concluded, the students had to take notes in their science journals to explain what they saw and the procedure. The next day's lesson consisted of the students learning that the material of the boat will determine if it sinks or floats. The students were given boats that were made out of different materials but were the same size. The class broke off into groups and checked to see what boats sank and which ones floated. The students were given weights to see what materials were the most buoyant. At the end of the lesson, they had to write down the materials they used, the process, and what happened.

The next lesson taught the students about the distribution of weight on a boat. The students received plastic cups that they had to float in the water. The students tried to get as many weights in the boats without it sinking. After the lesson, the students had to write in their notebooks to tell the materials, procedure, and outcome. After these lessons, the host teacher took two days to have the students name types of boats. The students were then paired off with a buddy and each group drew a different type of boat and wrote a sentence on what their boat was used for. On the next day, the class discussed why some boats would be good for certain activities and others would not work. The unit was a week long and occurred every day after 10.30 am. The lessons began on Tuesday and finished the upcoming Monday. On Tuesday, the students took a test to show what they had learned. The tests were graded by the teacher and given to the researcher with the students' numbers on them rather than names. The students received a survey on the Wednesday after taking the test asking them if they liked this method of learning compared to a more traditional approach of note taking. The students' notes that they have been taking throughout on what they learned each lesson will also be analyzed to see if the students comprehended the information being taught.

**Data Sources :** The first data source that was used was a pretest. The students received a pretest before beginning the # buoyancy unit; see the pretest. The pretest was made up of questions from the science teacher's manual of the textbook and questions the host teacher had made. The pretest showed what the students already knew about the subject. The students' background was very important to know in order understand what the students learned during this unit. If the students had already known the information from a previous grade then we would have had to modify the lessons. The pretest served as a base to reference the test given at the end of the unit. The two tests were compared to see what the students learned during the productive buoyancy unit. The post test was given to the students the day after the unit was finished. The reason it was given so soon after the end of the unit is the researcher did not want the students to study hard for the test. The students were given instructions to look over their work in their science notebooks, but that was all. In order for the test to be truly useful, the grades needed to be based off of what they learned in the hands on activities and discussions. The tests were compared to see how well the students did on the first one and second one. The second data source that was used was a sample of student note taking. The students wrote in their science notebooks their predictions, materials, procedures, and outcomes. The students did this after the three experiments that they performed. The note books were needed to see what the students observed, could describe and could express in writing each time they performed a hands on activity related to buoyancy. The notebooks were written in the students own writing so the researcher can tell what the students get and what they struggle with. They were also a good reference to check to see if the students understood the productive activity.

The third data source analyzed were the field notes that the researcher took while observing the students participate conducting in the experiments. Notes were taken in order to see if the students were enjoying themselves and the lesson. The researcher also asked the students questions to see if they comprehended the experiment. An example question was, "Why would the boat sink when you changed its shape?" The answers to the questions were recorded in the notebook. The observations were used to comprehend the students understanding and how much they were enjoying the activity. An observation checklist was used to quantify the data. The final data source was a survey that was given to the students upon completion of their test. The survey was given the day after the science test. The purpose was to find out how much the students enjoyed this form of learning compared to the traditional method of note taking and reading from a book. The survey also found out if their interest in science had increased after doing this form of learning.

**Analysis Process :** Once my data collection was complete, I looked at the scores from the pre-tests and post-tests. The information was uploaded into a chart and the grades on the two tests were compared to find out how much the students had learned. The questions from the two tests were very similar, but worded differently so the information could be easily compared. The tests showed the amount of improvement that occurred after doing the productive on activities on buoyancy. The notes taken by the researcher and the students were analyzed in order to find out what the students had learned. The notes by the students were looked at to see if the students understood the experiments and were able to explain their ideas. The notes were good to look at in order to see if each experiment was successful or if the students understood certain concepts. The researcher's notes were looked at to see how well students were able to answer probing questions. They were also used to look at how much the students enjoyed the activities. This form of qualitative analysis was good for understanding how effective hands on teaching methods are and how much the students enjoyed the lesson. The survey is the primary instrument that was used to see if the students enjoyed learning through the hands on method. The students answered the questions in order to tell if they enjoyed learning through experiments rather than texts and notes. The students also answered questions to tell if their interest in science has increased after doing the hands on buoyancy lesson. The scores from the survey were analyzed in a table. The table was looked at to see how many students liked this method and how many students changed their opinion of science.

**Validity :** The research conducted was carefully completed and studied. The information collected was recorded during the time in which it took place and in great detail. The research was conducted in the context of the classroom which allowed the researcher to collect more accurate information because the participants were in their natural setting. The researcher was also as objective as possible when taking notes and analyzing the data. Various data sources were used so that the information was looked at from multiple perspectives. In order to secure accuracy, the information was collected in an anonymous matter so the students did not feel pressured to answer certain ways. Most of the work collected was also part of their daily routine.

**Limitations of Study :** The results of the study cannot be generalized to any other situations then the ones in this study. In this particular study, the implications found have been carefully studied and examined. The study was conducted over a short period of time with limited resources. Research was only conducted in one classroom in which the researcher was working so larger studies would need to be done to make the information more accurate. Another limitation of the study is that the researcher was not the primary teacher in the classroom, but rather a student. The researcher had not been there throughout the entire year so the information known about the student is less than what a teacher would know. Also there is no comparison group who learned without a productive on science lesson.

**Findings :** Science education in elementary schools has been lacking because of internal and external factors. According to Patrick et al. (2009), some external factors are time, classroom management, materials and equipment, and dealing with diverse learners. Internal factors include self-confidence levels, professional identity toward teaching science, content preparation, and attitude. Teachers push science to the side because they often do not feel comfortable with the content and do not know how to teach the subject. This study was conducted in order to find out if students learn science better through productive on learning or traditional teaching methods in the elementary and middle school classroom. Teachers need to know the best methods of teaching science so they will feel comfortable with the curriculum and not push science aside in order to teach other subject matters. According to the researcher has shown "the importance of early experiences in science so that students develop problem-solving skills that empower them to participate in an increasingly scientific and technological world." Science is becoming increasingly important in our society so students need to develop the scientific skills that will help them succeed. That is why this study focused on hands-on learning in order to find out if it makes science easier to learn and more interesting for elementary and middle school students.

This study was conducted in a seventh students' classroom in a rural community of Tamilnadu. The students participated in a productive science unit on Buoyancy. The students pre-test, tests, and science notebooks were examined to find out how effective the unit was. In order to find out how many students enjoyed the unit, a survey was given at the end of the unit. The researcher also took field notes while the students where conducting the experiments in order to check for comprehension and see if the students were enjoying themselves. All of these data sources were examined in order to find out if the students enjoyed this productive science unit and if it was effective in teaching the students about #Buoyancy.

**Key Findings :** From this study three key findings emerged; these findings were; the unit was effective in teaching about # Buoyancy, students enjoyed learning about buoyancy through hands-on inquiry, and students' interest in science did not increase. The productive on unit was effective in teaching the students about Buoyancy and the students enjoyed learning, but it did not increase their interest in science.

- The unit was effective in teaching the students about buoyancy.
- Students enjoyed learning about # Buoyancy through productive methods.
- The students' interest in science did not increase due to this unit.

### **Effective Method of Teaching**

The most important finding in this study was that the productive method was effective in teaching the students about the topic of # buoyancy. The findings show that student's understood the concepts being taught and their grades significantly improved from the pre-test to the post-test. The students notebooks and tests were examined which showed that the experiments helped teach the students about buoyancy and they understood the main ideas of the unit. The students' grades significantly increased from the pre-test to the post-test indicating that the students learned through the productive method. The students were given a pretest prior to starting of the unit. The questions were based on information that they would be learning in the unit. The questions on the post-test checked for understanding of the same information, but were re-worded. The majority of the students' scored significantly higher on the post-test compared to the pre-test. No student received a grade lower than what they had received on the pre-test. The data shows that the students were able to learn about Buoyancy through productive method. The majority of the class scored significantly higher on the post-test which proves that students understood the information and learned the main concepts of the unit. The students' science notebooks were also analyzed and showed that students understood the experiments and the concepts that they were supposed to take from each experiment or activity. After each experiment, the students wrote in their journals and had to explain the process and what they learned from it. The journals checked for understanding and were graded on the content. The students received a check plus if they explained the whole experiment and what it taught them. They received a check if they still understood what the experiment showed, but did not have all parts of the experiment. Lastly they received a check minus if the journal was complete, but did not tell what they learned from the experiment.

### **Increased Enjoyment in Learning**

The findings also showed that students preferred the productive method of learning science. The students enjoyed learning about Buoyancy through productive methods and projects. The evidence from this finding came from my field observations and the survey given to the students at the end of the unit. Both data sources show that the students' liked this method and were engaged in learning. The students were given a survey at the end of the unit that asked the students their opinions on the # Buoyancy unit. The students clearly preferred the productive method more than the traditional teaching method of taking notes which they had done in past units. Not one student said that they would prefer to take notes rather than performing experiments. The majority of the students also answered that they would like to use. The students clearly had fun with this unit and enjoyed learning through the productive approach. The observation checklist also supported the finding that the students enjoyed learning through productive on science. During the experiments, the researcher filled out an observation checklist in order to see how engaged the students were and how much fun they were having. The observation checklist looked for six different things. One of the categories was that the students were having fun. When conducting the experiments, the research found that the majority of the class was smiling and having fun. The observation checklist was also used when the students were checking the durability and speed of the boats they made at home. The students liked this activity so much that each day they would ask what they would be testing on their boats today. The observation checklist also looked to see how many of the students were engaged. All the students were actively participating in the experiments. On some days, the students seemed to enjoy the experiments more. The students really liked the activity in which they tried to get the cup with the most pennies to stay afloat. There was also a correlation between the higher grades on students' notebooks and how much they enjoyed that days experiment. The day with the pennies also had the highest amount of check pluses in the students' notebooks. It seems that the more fun and engaging the experiments, the better the students comprehended the information. According to the observation checklist, the majority of the students were engaged and having fun participating in the experiments and boat project.

**Interest in Science :**The finding that was the most surprising was that the # Buoyancy unit did not increase students' interest in science. According to the student survey, the majority of the class did not believe that their interest in science had increased after completing this unit. These findings were surprising because the majority of the students answered that they enjoyed this unit and would like to continue to productive in science.

Only six students said that their interest in science had increased, four students said maybe their interest had changed, and six said that they had no more interest in science after completing this unit. The amount of no responses was surprising, but it could have been due to factors not relating to the unit. Some of the students may have liked science before the unit and maybe they just continued to like science after the unit. Other students could just hate science and it is going to be hard to change their minds. There are also students who just don't

like experiments and would prefer to take notes. The two students who said they preferred to take notes rather than do experiments also responded that their interest in science had not increased. This is not surprising since they did not enjoy learning through the on productive method. It could take more than one unit to change these students' minds and increase their interest in science. Researcher conducted a research under third standard students' on science, the students produced the following product by own. The productive methods of teaching to develop creativity of students'



The same students' after learnt the lesson, had written the following own story, so the productive teaching methods to develop students thinking skills.

☆ ☆ ☆ ☆ ☆ ☆ ☆  
 ☆ Tinker bell ☆  
 ☆ ☆ ☆ ☆ ☆

**Introduction :** I am c.s.priyasree III –A I produced a creative story about tinker Bell this is my own imagination. This story will attract small children's.

**Twinkle Barbie :** One day deep dark night stars are blinking on the sky. There are many houses are locked. But one house is opening There is a small baby the baby name is: - lily. She comes to upstairs of her house she saw on the sky there are plenty of stars are blinking. The lily suddenly oh my dear tinker Bell Come here with me. Tinker Bell came to nearby lily, she told to tinker bell I cannot fly like you. The twinkle Barbie tell to lily you do not sorry I can help you to fly think you tinker Bell as soon as the lily have long wings now ready to fly. The Tinker Bell gifted a neck less to lily. Lily got white dress like tinker Bell. Now the tinker bell takes lily to the stars. Twinkle Barbie friends say, you prepared a new robot? No it is not she is my friend her name: - is lily. Oh she is beautiful thanked friend's .the lily mother and father Call the lily contact over the phone from stars she return to home.

**Unanticipated Findings :** A further finding that was not anticipated was the fact that productive learning improved the students writing in their notebooks. The students' notebooks were analyzed in order to find out how much they learned from each experiment. When comparing the grades of the notebooks, the students' grades continually increased each time they wrote in their notebook. By the end of the unit, the students were able to explain their ideas more clearly and gave better descriptions of the experiments. The students explained in much more detail the process of the experiment.



Most students were able to write step by step instructions on how to do the procedure. By the end, the students were also using sequential words like next, last, and during in their writing. The quality of their work had clearly improved. The students were also able to explain their ideas better by the end of the unit. The students' abilities to write about what they had learned had increased. At the beginning, the students were briefly writing about what they had learned. In the end, the students were writing longer paragraphs and using more details to talk about the concept that they been taught. An important skill in science is for students to be able to problem solve and explain their ideas and the journals show that students were able to do this in their writing. This finding is significant because science is often pushed to the side because teachers are worried about students writing abilities were improved through writing about each experiment. An important skill is using sequential language when writing. By the end of the unit, the majority of students were using this language in their class to explain the experimental process. These findings show that science does not need to be pushed aside for other subjects because science instruction can be used to improve students writing abilities.

### **III. DISCUSSION**

Science education in elementary schools is severely lacking because of the emphasis on Math State tests and teacher's lack of confidence in the subject matter. When the information was analyzed it showed that the unit was effective in teaching students about buoyancy. The student's grades from the pre and post test greatly increased and their journal grades increased throughout the unit. Another important finding was that students enjoyed learning about buoyancy through hands-on inquiry. The survey showed that students liked this learning style and through observation the researcher saw that the students were smiling and engaged throughout the lesson. The last finding was surprising because even though the students liked learning through productive on science their interest in science did not increase. These findings showed me that the unit was effective in teaching science and the students enjoyed learning, but it did not help enhance their interest in science. There was one finding that was not anticipated. The writing in the student's notebooks got significantly better throughout the course of the unit. The students were able to write more clearly about the experiments and used more sequential language. As a pre-service teacher, this research has been important because it has shown me how fun science can be for the students. Throughout the whole unit, the students were engaged and enjoying themselves, but still learning a variety of information and skills. Completing this research has shown me how important it is to look at the ways you teach and rework them when they are not the most beneficial method for the students to learn. The findings also indicate that teaching science through productive methods effective and engaging for the students. This information can be used in the classroom to help rework the science curriculum. Teachers need to re-examine how they teach science and move from a traditional method to a more productive method. Other important finding shows that science should not be pushed to the side in favor of other subject matters because teaching science through productive can help students develop skills in other areas. This research will be beneficial to teachers who are looking for better ways of teaching science that engages the students and helps them learn.

**Recommendations for Practice :** The findings in this study can help teachers improve their science curriculum to make it more effective and stimulating for students. The first finding of this study was that the unit was successful in teaching the students about buoyancy. This has many important implications for teachers. The most significant is that productive on science is an effective way of teaching. The student's grades drastically increased from the beginning of the lesson until the end. Many teachers believe that the students are not learning as much because they are talking. Teachers often think that the best way for students to learn is to lecture at them and then they take notes. The results from this study show that this is not true. The students are learning when they are actively exploring their education through productive methods of science. Research that showed that students' improved their problems solving skills and received better grades, when they used productive on science, Teachers who are not comfortable with the material and shy away from experimentation can look for outside resources. The unit was shown to be effective and that comes with step by step directions and tells the teacher what they need to know and teach. Also, many science textbooks come with resources that have experiments and productive activities that go along with the information in each lesson. Teachers should not feel uncomfortable with using productive science because it is beneficial to their students and themselves. If the students are constantly engaged then there will be less behavior problems and students will learn the material quicker. This will leave more time for instruction in other subjects or to go further in depth on the science topic. Using productive science in the classroom is valuable to the students and the teachers so science curricula should be modified in order to make sure that the curriculum best represents the needs of the students. The research also revealed that students enjoyed learning about buoyancy through productive inquiry. Researcher found that students who participated in productive held positive motivational beliefs and thought that science was easy, they were good at it, and that they liked science. Similar results were obtained in this study because the students enjoyed this productive methods this unit and were engaged throughout the

experiments. The Patrick et al. (2008) study shows that teaching methods are not just important because of how students learn, but also in motivating them. Students need to have positive attitudes about science in order for them to want to learn. Since the productive method has been shown to be more fun and engaging for students it makes sense for teachers to switch their curriculum. Students will not learn if they are not interested so instruction needs to be adapted so that students are benefiting from what they are learning. In my student teaching, the school offered enrichment in which the students went to once or twice a week. Enrichment focused on teaching science through productive methods. All the students in my seventh grade class loved going to enrichment and when they came back they would be able to explain what they have learned. When I observed enrichment, the students were engaged and laughing while they were playing science games about endangered species. After the game, the students were able to explain why species are endangered and extinct. This experience backed up the research because it showed that using productive methods of activities made science fun for the students, but they were also learning. Teachers will be able to use their science time more wisely if they switch to the productive methods of teaching because students will gain more from the instruction.

Data from the study indicate that the students' interest in science was not increased due to this unit. This finding was one of the most surprising because I believed that the students' interest would increase if they were enjoying and engaged in the unit. The researcher observed found the research indicated that a productive method of science is beneficial to the students and not only helps students learn, but also increases their interest in science. The likely reason for this finding is the fact that the unit was only two weeks long so it was not enough time to influence the students' perceptions about science. When productive methods are used in the classroom for a long period the students' interest in science may be enhanced. Even though the students overall interest in science did not increase, it also did not decrease. The students still enjoyed the unit and learned. There was also an unanticipated finding that supports the use of productive methods in the classroom. The unanticipated finding was that students writing improved throughout the course of the unit. The students wrote in their own after the experiments and working on their boat project. The grades and quality of the students' writing drastically increased over this short period. Howes et al. (2009) found that science can be used as a vehicle through which to develop literacy skills and include science in the curriculum. Teachers who are skipping over science in order to teach need to think carefully about this decision. Science teaching can support the curriculum and help develop students reading and writing skills further. By having students write about what they are doing in science they are using higher order thinking and developing their writing skills. Another way that teachers can integrate the curriculum is using children's books to help teach the students science. By integrating the two subject areas, the students can still be taught science but also teachers do not have to give up time. One subject does not have to be sacrificed for the other. Science teaches student's problem solving skills that are critical for advancement in our every expanding world. Teachers do not have to sacrifice time because this study shows that science education can help improve student's writing. According to this study, science can be made fun and engaging for students through productive method is an effective method of teaching science in elementary school classrooms.

**Recommendations for further Research :** The research in this study supports productive method in the elementary middle school classroom. More research must be done in order to determine the overall effectiveness of this type of science. Research needs to be done at various grade levels, settings and with various methods of productive method in order to make the data more accurate. Since the study was only conducted in a seventh standard classroom, additional grade levels should be looked at to see if these results are accurate for all children in the school. Productive method may be effective in the seventh standard, but not in 1<sup>st</sup> standard so these various section levels should be examined. Furthermore, similar studies need to be done in different locations to make sure that productive method is not only valuable other places besides rural schools. This study examined a very small sample so students in different areas need to be studied in order to check and see if these results are specific to this certain population. In this study, the teacher only used the productive method on buoyancy unit. Further studies would need to try out different types of inquiry in order to see the effectiveness of various methods. One form of hands-on inquiry might be less valuable than another in teaching middle school children. In addition, research should look at the effectiveness of a completely productive method of science curriculum. Productive method was shown to be successful in this study, but it is not known if it should be used in conjunction with other methods. Maybe productive method is best used be used in combination with traditional teaching methods. In order to completely understand the effectiveness of productive method, research needs to be done to see how much of the curriculum should be taught through this method or if a variety of methods should be used. This study found that student's writing improved as they progressed throughout the unit. Further research needs to be done to see how successfully science can be integrated into other areas of study. Schools are extremely focused on test scores in science needs to be integrated into other subjects so that the

curriculum is not lost. We live in a world driven by technology so students need to have problem solving and critical thinking skills in order to be successful. Science cannot be lost in the curriculum therefore more research needs to be done on the effectiveness of integrating other subject areas into writing especially through productive method.

#### IV. CONCLUSION

As a future teacher, I have been in the classroom observing and I have quickly seen how science is the first subject to be thrown out when teachers feel like they need to cover more other subjects. The students are suffering because they are not learning important reasoning, processing, and critical thinking skills that are important to be successful. This research showed that science can be an extremely engaging process that students enjoy and can't get enough of. Schools need to modify their curriculums so that science is not disregarded, but rather taught in a meaningful way in which the students enjoy learning. Not only will the students develop critical thinking and problem solving skills, but they will also improve in other subject areas. Reading and writing can easily be integrated into the science curriculum in order to make sure that teachers have more time to cover other subject material. The elementary and middle school science curriculum needs to be changed in order to involve more productive method science and integrate other subject matters because this research has shown that this is an effective way of teaching elementary and middle school science.

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