

# 21<sup>st</sup> Century Workplace Skills in a 7<sup>th</sup> Grade Science Classroom



**TEACHERS IN INDUSTRY**  
Partnering with business to prepare the future workforce

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## INTRODUCTION

I observed in my classroom that students were more interested in following a list of items in order to get a good grade rather than immersing themselves in the curriculum. I found that my students lacked critical thinking skills and the ability to ask questions in small groups. Each person only saw their individual role instead of how they needed to work together.

## RESEARCH QUESTION

**How did the use of peer tutoring and science journals support my 7<sup>th</sup> grade science students' development of critical thinking questions?** When I analyzed this question I investigated strategies where students could understand the curriculum better but also could communicate and interact positively with each other.

## CONNECTION TO INDUSTRY

As a teacher who worked in the summer at Salt River Project (SRP), I observed several employees solving problems and mentoring each other. SRP sponsors two major programs that create this atmosphere. They are a mentoring program and a rotator program for engineers and analysts. Similarly, I implemented a program where students could communicate better and could ask good questions so they would be more prepared for science-related careers.

## INVESTIGATION/METHODS

Students tutored each other at least once a week for 15 minutes. Data was collected from one class of 30 students for 10 weeks during the 3<sup>rd</sup> and 4<sup>th</sup> quarters of the 2013-1014 school year. Data was collected through a pre and post surveys to better understand students' perspectives on peer tutoring and asking questions. Six selections of their peer tutoring evaluations were collected and science journals were collected on four different occasions to track their questions and thinking. Science journals were kept using the Cornell note-taking method. This method included a description or details section, a list of key terms, a summary, and a question section.

### PEER TUTORING EVALUATION FORM

Category	Emerging 1 point	Developing 2 points	Good 3 points	Peer 4 points	Total Points
Attitude and Effort	is polite, friendly, and is respectful to working together.	is respectful to the conversation, and asks good questions, and responds thoughtfully to the tutor.	is respectful to the conversation, and asks good questions, and responds thoughtfully to the tutor.	is respectful to the conversation, and asks good questions, and responds thoughtfully to the tutor.	4
Participation	is included in the conversation, and asks good questions, and responds thoughtfully to the tutor.	is included in the conversation, and asks good questions, and responds thoughtfully to the tutor.	is included in the conversation, and asks good questions, and responds thoughtfully to the tutor.	is included in the conversation, and asks good questions, and responds thoughtfully to the tutor.	5
Knowledge and Supports	gives encouragement and supports feedback without comparison.	gives encouragement and supports feedback without comparison.	gives encouragement and supports feedback without comparison.	gives encouragement and supports feedback without comparison.	3
Feedback	allows me to do my own work and ask questions.	allows me to do my own work and ask questions.	allows me to do my own work and ask questions.	allows me to do my own work and ask questions.	3

### CORNELL NOTE-TAKING JOURNAL ENTRY

Key terms: carrying capacity, limiting factors, niche

Objective: I can recognize and graph a model of a population's carrying capacity by plotting a bar graph.

Bell curve: Carrying capacity is the maximum size that a population can reach in an ecosystem.

Limiting factor: Any factor or condition that limits the growth of a population in an ecosystem.

Niche: The role an organism plays in its environment for the things the organism does to stay alive - how it gets food, shelter, and find its mate.

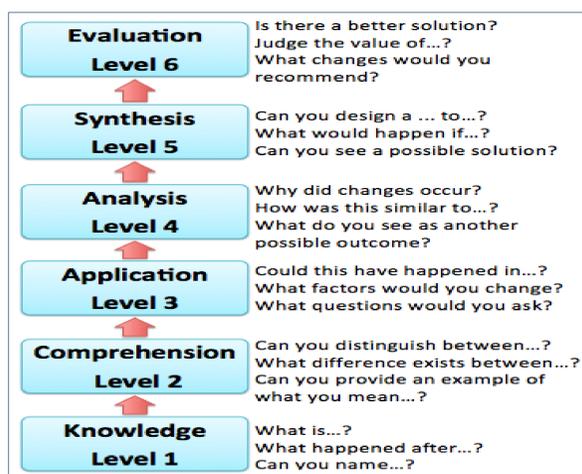
Carrying capacity: all the things that a carrying capacity can support.

Limiting factors: any factor or condition that limits the growth of a population in an ecosystem.

## DATA COLLECTION AND ANALYSIS

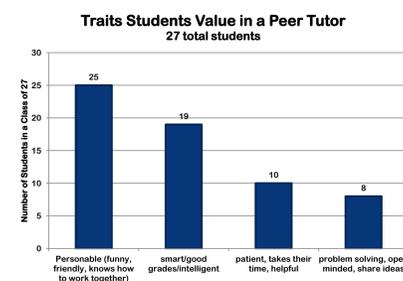
Field notes were analyzed to identify what traits should be reinforced during peer tutoring. A pre and post science class survey was administered to document student progression in understanding the purpose of peer tutors and how to ask questions. Student journal entries and peer tutoring evaluation forms were analyzed using a rating scale based on Bloom's Taxonomy to characterize the development of higher-level questioning skills.

### BLOOM'S TAXONOMY RATING SCALE\*

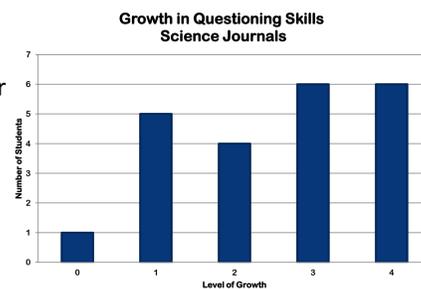


## RESULTS/FINDINGS

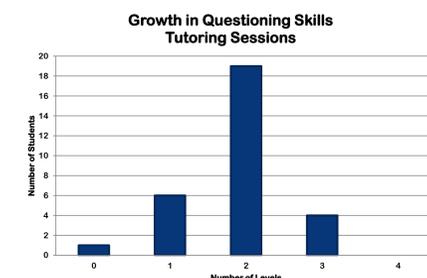
1. Reinforcing positive traits such as friendship, patience, helpfulness, open-mindedness, and being able to problem solve, created a supportive atmosphere during peer tutoring.



2. Journaling using the Cornell note-taking method improved critical thinking for questioning skills for most students. 95% of students experienced some level of growth in the Bloom's Taxonomy Rating Scale. 55% of students grew between three and four levels in the Bloom's Taxonomy Rating Scale.



3. Tutoring sessions that focused on labs exhibited the most diversity in the types and levels of questions recorded. 97% of students experienced at least one level of growth in the Bloom's Taxonomy Rating Scale. 63% experienced at least 2 levels of growth in the Bloom's Taxonomy Scale.



## BEFORE

- 80% of students at the beginning of the unit felt comfortable asking their peers questions to get help on homework, class work, and labs.
- 60% had never participated in peer tutoring training.
- 65% had never been a peer tutor before.

## AFTER

- Students understood the challenge of forming good questions. By the end of the unit 60% still agreed that they could ask their peers what they did not understand.
- 26% more students felt more comfortable asking question during whole class discussions at the conclusion of the unit.
- 30% more students felt that asking questions is necessary for completing assignments.

## CONCLUSIONS

- Developing interpersonal skills helps create an atmosphere where students feel comfortable asking questions.
- Students do not always understand how valuable asking questions are and need additional support through structured activities like peer tutoring to help them see their purpose.
- Journaling using the Cornell note-taking method provides a way for students to reflect and develop higher level questioning skills.
- Activities such as labs encourage the development of higher level questioning skills.

## CHANGES TO THE CLASSROOM AND FUTURE WORK

- Emphasize interpersonal skills and give students opportunities to develop them in structured activities like peer tutoring.
- Provide multiple opportunities for students to ask questions and continue to teach the different types and levels of questions.
- Continue to encourage students to reflect in their journals about what they have been learning.
- Use labs and other higher level thinking activities more to teach material and to reinforce critical thinking skills.

## REFERENCES

Chart adapted from <http://www.meade.k12.sd.us/PASS/Pass%20Adobe%20Files/March%202007/BloomsTaxonomyQuestionStems.pdf>



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