How to Improve

Science Bowl

Mira Loma High School

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Introduction

This is an article that aims to provide a point of view on the process of improvement in Science Bowl. Because of the steep improvement curve associated with Science Bowl, some sections of this guide will be largely useless to newer players, mostly because the finer points of making the push from a Round Robin Nationals Team (middle tier) to a top 16 Team (mid-upper tier) involve improving as a team rather than improving as an individual. While this guide can be read from start to finish, this intention is for newer players to focus on improving in one or two areas at a time.

The approach detailed in this guide is something the 2008-2009 Mira Loma team used to secure a 2nd place finish after 2 months of practice and a 1st place finish the year after. The overall lessons regarding work ethic and structured studying in this guide can also be used for relatively quick success in most competitive ventures.

Goals.

The first step is to establish the end that you are trying to achieve by improving at Science Bowl. This may seem obvious at first, but few people are initially capable of optimizing their practice methods to fit their goals. Are you just trying to get onto one of your school's competing teams? Or are you trying to pull your team across the chasm that is the difference between a top 4 team and a top 16 team? The most efficient ways of achieving these two goals are vastly different, and attempting to apply one to the other will not produce results efficiently.

If you're just trying to get onto one of your school's competing team, the most sensible approach is to simply take AP or IB science classes and go to your team's practices. If that's your goal, just go ahead and do it and don't worry about the players on your team that try to pass judgment on you. Generalists tend to start feeling superior about their study methods, but if getting on the B team is all you want to do, then pay them no attention. The means in which you take to achieve your goal are solely dependent on what your end goal is.

On the other hand, if your goal is to improve as much as possible, then why would you limit yourself to the miniscule amount of science you'll learn from your classes? At the very most, you'll only be able to answer questions at the Regional tournaments, perhaps getting the odd question during Round Robin at Nationals, contributing very little to your team. If you want to help form a team that will only be able to steal the occasional games from higher tier teams, then a great example to follow is the 2009 Rio Americano team, whose study schedule consisted of approximately 20 man-hours after their 4 years of AP science classes.

The training method in this guide is geared towards on building fundamental skills to shape strong all-around players who can perform well at all levels at competition, but improve in

their play as the questions get harder and harder. This skill set takes the longest time to develop, but it will shape consistent players. There are a wide variety of playing styles that can evolve out of this training style, including strong generalist players such as Seth Tietler, a consistent style such as that played by Shaun Mehra, or a potent mixture of the two.

In order to achieve your highest potential, you must strive to be part of a team that can win even if the opposing team is always faster on the buzzers. This may sound counterintuitive at first, but a team that can answer 24 out of 25 tossups a round is going to win far more rounds than a team that always hits the buzzer first. A player with a strong knowledge base should practice his speed, but only to complement his knowledge pool, never because the only tossups he can get are giveaways he steals from the other team with his superior speed.

Teams that best showed this attribute in recent history were the Mira Loma High team of 2009 and the Santa Monica High team of 2008: as the harder the questions got, their chances of winning rose. Their Nationals experience consisted of matches that they won convincingly or teams that tried to cut corners with risky play to gain a decisive edge over them. Even when playing teams who cut corners, their strong knowledge bases and consistent play allowed them to stay competitive.

On the other hand, there are teams like Parkview High circa 2009: their play style required large point advantages being gained via risky interrupting play. Otherwise, they gave up far too many points to the opposing team to win the match. Simply put, a team consisting of players with a solid knowledge base and understanding of the game is far superior to one-dimensional speed based players, who end up being just that – one dimensional.

Part One: Myths about Studying

Most players are limited not only in their knowledge, but they also tend to possess misconceptions about how to properly acquire knowledge. By far the biggest problem pervading Science Bowl in recent history is lack of attention coaches give to rectifying these misconceptions. The following is a list of a few of the most crippling of these beliefs.

Science Bowl Questions are Trivia.

One of the biggest assumptions that newer players glean after watching a round of Science Bowl is that the questions are trivia questions. This assumption seems to arise from the fact that most freshmen have never learned science in a structured, methodical way, so the few answers that they do know came from a myriad of sources.

The trap that newer players tend to fall into is thinking that they'll never be able to efficiently improve their knowledge pool through studying. This tends to lead to newer players looking up to stronger veterans, but being unable to determine *how* they became good at Science Bowl. Fortunately, this error is easily corrected, but the recent history of Science Bowl is littered with teams that fail to instill proper training methods in their younger members. In fact, since the National Science Bowl grew to over 50 teams in 1999, only 2 teams have reached the final round for more than three years running, which indicates that a lot of schools do well not because they have good training methods, but because they happen to have two or three players in the same year that became strong of their own accord.

The only reason that this misconception gets perpetuated is the general lack of good study habits exhibited by lower to mid tier teams, even by their more experienced players. If they are a middle tier team, consistently reaching elimination rounds in their Regional tournaments and occasionally sending a team to Nationals, chances are that the vast majority of their players have weak knowledge bases consisting of facts learned from science classes and the occasional encyclopedia article that they read when they were younger. These players, who do reasonably well at Regionals, graduate thinking that Science Bowl questions are based on random knowledge. Because they never take the opportunity to correct the misconceptions of the freshmen and the sophomores, this misconception is perpetuated endlessly.

Wrong Sources.

If you want to become good at Science Bowl, you must learn from the strongest players who have come before you. The biggest questions are: what sources do you learn from, and how do you learn it?

The very best players who know what they are doing are always the players you should be putting blind faith in, while you should think carefully about the advice that you get from less skilled players. By ingraining the study and practice habits of top players, any weaker parts of your play can easily be shored up. If newer players join their school's Science Bowl team and find that they have no incredibly strong players to learn from, following the advice of middle tier players can perpetuate the poor habits that have held back the school as a whole.

The major advantage of learning from many strong players is that there is not just one way to improve at Science Bowl. The methods detailed in this guide are a variation on the study methods used by Rishi Kulkarni (2009 Mira Loma Team Captain). However, the habits that you ingrain in yourself should be most like those of a player whose style of playing you feel most comfortable with, be it a generalist or a subject specific player.

The major problem with the "only listen to players in the top 4 teams" approach is that the study habits they used to move from medium tier to mid-upper tier generally do not produce

very fast results. While many players can reach the middle tier of play with merely a rigorous courseload, making the push to the mid-upper tier requires a minimum of 60 hours of studying. Unfortunately, there are very few shortcuts to this approach, but it is guaranteed to produce consistent players.

Speed is Everything.

Oftentimes, newer players blame their inability to answer questions in a round on their reflexes. The most common excuse tends to be, "I knew the answer to five more questions, but so-and-so was faster than me!" However, there is a distinct difference between having a general idea of what the answer is and having the confidence to buzz in early. After the answer has been read, it is easy for players to convince themselves that their inkling of the answer meant that they actually knew the answer, but the ability to buzz in early in high pressure situations is something that only results from true, comprehensive knowledge of the question. Strong players not only know which answer is right, but also which answers are incorrect and why.

The most important myth in regards to speed that newer player must dispel from their minds is the idea that reaction time has any effect on your play. Any attentive player will have a gap of 100 to 200 milliseconds between the moment they decide they know the answer and the moment their finger presses the buzzer. For reference, the average human speaks at about 2.5 words per second, so 200 milliseconds is not even enough time for the moderator to say another word. On the other hand, any lack of confidence in a player's knowledge can cause up to several seconds of hesitation, which is where the misconception of "my reaction time wasn't fast enough" arises. Rather than having a fast trigger finger, having a good knowledge pool based around various "trigger words" will result in much more tossups answered per round. An example of using trigger words to answer a question is the following:

1. BIOLOGY *Short Answer* During photorespiration, the plant enzyme RuBisCO (read as: rue-BIS-ko) will bind what molecular substance rather than carbon dioxide?

A player who has organized his knowledge around the idea of trigger words will be able to buzz in confidently and say "oxygen" after hearing the two trigger words in the question: photorespiration and RuBisCo. Less confident players may wait until hearing the words "will bind," but careful consideration of the first six words of the question reveals that there is nothing else that the question could be asking for. Note that having trigger words will not always give as decisive of a timing advantage as the example shown above, but it will streamline your knowledge into easy-to-recall chunks of information, which is ideal for Science Bowl. Admittedly, having confidence with trigger words takes a lot of experience, which is why practicing frequently has no substitute in improving as a Science Bowl player.

Part Two: Good Study Habits

The moment a newer player decides that he wants to study and become better at Science Bowl, he must carefully choose how to proceed. The only tried and true method to average 7 tossups a game, however, is through rigorously following an organized study schedule.

Let's take studying biology as an example: the canon source for Science Bowl biology questions is, and always has been, the most popular AP Biology textbook: Biology by Campbell and Reece. The best way to improve at answering biology questions is simply to read the book cover to cover. This is a task that, even with a fairly quick reading speed, will take a minimum of 60-70 hours to complete. Of course, merely reading the book is not enough to solidify the immense amount of information – note-taking and question writing are also necessary in order for the basics of the text to become second nature.

Many newer players seem to disregard note taking when studying, but it vastly improves retention rate while simplifying future review. At the very least, every key word should be written down, but by far the most effective method of studying is to write down every fact that you do not already know. Frequent review of your notes will force this knowledge into your quickly accessed long term memory.

Players who study via this method will improve very slowly at first, but they will be setting themselves up for explosive growth later in the season. In other words, there is not a linear correlation between how much you read and how many questions you will get during a round. Once you finish the entire text, however, you will notice a marked increase in your tossups per round.

Another aspect of studying is maintaining the information in an easy to access mental dossier. Because Science Bowl is about how quickly you can recall the facts in question, any reading you have done must be maintained with frequent review. This is something that any player will confirm as important: frequent review and practice is the only way to prevent the effect the slow decay of memory will have on your game.

Recommended Textbooks.

Ideally, every new player will use the above method to learn two to three subjects extremely well. At the time of writing this guide, the subject categories at the National Science Bowl are Biology, Chemistry, Physics, Earth and Space Sciences, Energy, and Mathematics. Energy was just introduced this year, so this guide will be unable to provide the best advice on studying it in this edition, but the other subjects are best studied as follows:

Biology: The best introductory textbook is Biology by Campbell and Reece, providing both relatively specific knowledge and a wide breadth of knowledge. After reading this, a player seeking to specialize in biology should look to read Molecular Biology of the Cell by Alberts and Vander's Human Physiology by Widmaier. Due to the nature of biology questions at the National Science Bowl, it is recommended that a player focusing in biology limits him or herself to only one other subject unless they want to make a massive time commitment. Admittedly, 90% of the biology questions at Regionals and Nationals are covered just by reading Campbell and Reece, so reading the more advanced texts in biology can be put off until the team is confident in every other subject.

Chemistry: The two textbooks that encompass most of Science Bowl canon are Chemistry by Zumdahl for the breadth of knowledge and Chemical Principles by Atkins for depth of knowledge. Newer players should read Zumdahl first in order to gain a strong understanding of the subject before progressing to Atkins. Players who are interested in chemistry and feel confident in their background knowledge can start by reading Atkins, which provides an excellent overview of general chemistry which covers most, if not all of the chemistry questions at both the Regional and National competitions.

Physics: Physics has the most options when it comes to picking a book to study. Ideally, newer players will pick a calculus-based textbook for studying physics, but most new players do not have a solid enough foundation in calculus for such a text to be comprehensible. In the past, Mira Loma teams have studied from University Physics by Young and Freedman, Physics by Giancoli, and College Physics by Serway. Later in the National competition, however, physics questions start focusing on modern aspects of physics. A good introductory text for modern physics is The New Cosmic Onion: Quarks and the Nature of the Universe by Close. Because physics questions often involve calculations, it is recommended that newer players who are specializing in physics also specialize in mathematics.

Earth and Space Sciences: This subject is easily the most rewarding subject to study for. Because most high schools do not have astronomy or geology as part of their science curriculum, a brief overview of introductory earth science and astronomy will enable a player to easily get many uncontested tossups. The two best texts for this category are Earth Science by Lutgens and Tarbuck and Foundations of Astronomy by Michael Seeds. Both of these texts are relatively short, so any player with some spare time can learn either earth science or astronomy as a third subject. The Earth and Space Sciences is the subject that requires the most non-textbook reading to stay up to date, however, so any player wishing to specialize in the Earth and Space Sciences should dedicate time to reading recent articles about advances in astronomy and geology.

Energy: This is a category new to the 2010-11 National Science Bowl. Once the canon is established, this section of the guide will be updated.

Mathematics: In Science Bowl, any student who has taken AP Calculus AB knows how to do 90% of the math questions. Math is a subject that can only be improved by frequent buzzer practice in order to improve calculation speed. Often, a lot of teams cop out by picking a "designated math" player, but it is entirely possible for any player on a team to sharpen their mental math skills enough to be competitive at the National level. It is recommended that the math specialist also learns physics, another calculation intensive category.

Wikipedia.

Contrary to what many academics may say, Wikipedia is an excellent source of knowledge, especially when it comes to studying for Science Bowl. However, simply reading random science articles is not an effective way to get more tossups. The most tried and tested method to efficiently increasing your knowledge base that is relevant to Science Bowl is by reading the Wikipedia articles on topics you learned about through your textbook reading. Oftentimes, the Wikipedia article will contain facts that further flesh out your understanding of the topic while staying relevant to Science Bowl. Furthermore, studying the pictures and diagrams on the Wikipedia articles can be incredibly useful for both solidifying your understanding of a topic and making the push from a mid-upper tier team to an upper tier team.

In the last few double elimination rounds at Nationals, regular short answer and multiple choice bonuses are replaced with visual bonuses. Nine times out of ten, the visual is taken directly from the Wikipedia page related to the question, so a mid-upper tier team that finds itself with spare time before the National competition would do well to study the diagrams on Wikipedia articles.

New players, however, should be careful not to spend too much time studying from Wikipedia. While it does contain an enormous amount of information, it is nigh impossible to study it efficiently. While studying Wikipedia can help a veteran player go from knowing 90% of the physics questions to 95%, simply reading the canon textbooks is far more rewarding for newer players.

Part Three: Writing Questions

Perhaps the largest downfall of many prospective players is their view that writing questions is a chore, not an opportunity to improve. While just focusing on two or three subjects can create a solid team player, multiple people on the team must work together and study different subjects in order to create a top tier team. In order for a player to improve to the point they can carry a team on their own, they *must* write questions. However, there is a vast difference between writing questions that help you improve and simply writing questions.

The following is an example of one type of bad multiple choice question:

1. CHEM *Multiple Choice* – Which of the following methods can be used to convert aldehydes and ketones into 1, 3-hydroxyl compounds?
    W. Baylis-Hillman reaction
    X. Aldol-Tishchenko reaction
    Y. Ivanov reaction
    Z. Cannizzaro reaction

    ANSWER: X. Aldol-Tishchenko reaction

The problems with this question are numerous. While it is properly formatted, the approach the writer took to writing this question was deeply flawed. Perhaps the writer was under the impression that Science Bowl tests random scientific knowledge, but this question reflects poor content choice on multiple levels.

Firstly, the writer elected to use Wikipedia as a source of information rather than a textbook. While this in and of itself is not a question-ruining mistake, most new players are not familiar enough with the canon to pick content appropriate for a question without guidance from a textbook. Until a player has attended two or three competitions and heard official questions, they should only write questions directly out of the canon textbooks.

Secondly, the writer chose a very poor Wikipedia article from which to write a question. While Wikipedia *can* be an excellent source for higher level questions, this question highlights everything that can go wrong when only using Wikipedia as a content source. Aldol-Tishschenko reactions are not common course material for even 3rd year chemistry students and, at the time of this guide's release, the Wikipedia article for Aldol-Tishchenko reactions consists of only one paragraph and a picture of the reaction mechanism.

These two cardinal errors in question writing result in a question that most likely go dead, i.e. be unanswered by both teams. However, the writer does a few things well. The wording of the question is unambiguous and the choices are uniformly worded. The next example is of a poorly worded multiple choice question:

2. MATH Multiple Choice When a fair six-sided die is rolled, which of the following outcomes is least likely?
    W) a prime
    X) even
    Y) less than 4
    Z) The result is a perfect square

    ANSWER:Z) THE RESULT IS A PERFECT SQUARE

While the subject matter perfectly legitimate, the wording of the answers is exceedingly poor. The rule of thumb when writing multiple choice questions is that the choices should all be formatted identically. This enables more knowledgeable players to buzz in earlier. An improved wording for the above question would be:

3. MATH Multiple Choice When a fair six-sided die is rolled, which of the following outcomes is least likely?
    W) The result is a prime
    X) The result is even
    Y) The result is less than 4
    Z) The result is a perfect square

    ANSWER:Z) THE RESULT IS A PERFECT SQUARE

The last example is a multiple choice question with appropriate subject choice and good wording.

4. CHEMISTRY *Multiple Choice* Which of the following series is the atomic emission spectra when electrons drop to the 2nd energy level in hydrogen?
    W) Lyman
    X) Balmer
    Y) Paschen
    Z) Brackett

    ANSWER: X) BALMER

The material in this question would be covered by any introductory chemistry course in college, which is the difficulty that writers try to aim for at the Regional and National competitions. At the same time, the answer choices are worded carefully so that a knowledgeable player who hears the first answer choice can feel confident in buzzing in and saying, “Balmer,” without having to worry that the answer may be written down as, “Balmer series.” The objective of every question should be to reward knowledge.

Short answer questions, on the other hand, have a completely different set of guidelines for writing. There are two styles of short answer questions that have been popular in the recent history of Science Bowl: pseudo-multiple choice and classic short answers.

Pseudo-multiple choice questions have become increasingly popular in the later stages of the Regional and National tournaments. In general, pseudo-multiple choice questions should be written as if they were regular multiple choice questions, but the answer is more than one of the choices. The following question is an example of a well written pseudo-multiple choice question:

5. BIO *Short Answer* By name or number, indicate which 2 of the following 4 organelles possess double lipid bilayers:
   1: nucleus
   2: ribosome
   3: mitochondrion
   4: Golgi apparatus
   Answer: 1 and 3

As you can see, this type of question allows for more than one of the choices to be correct. Additionally, this type of question allows for more or less than four choices, which is why this style of question has become so popular at both levels of competition.

The second type of short answer question is simply that, a question with a short answer. The following is an example of a poor short answer question:

6. EARTH AND SPACE SCIENCE *Short Answer* What is happening inside the Earth where the deepest earthquakes occur?

   ANSWER: the Earth's crust is being subducted into the Earth's mantle

The writer of this question broke one of the cardinal conventions of the short answer question: the answer must be short. As obvious as it seems, newer players seem to disregard this rule fairly often. The following few examples are all excellent examples of short answer questions.

7. ESSC *Short Answer* Wien's law relates wavelength of the peak emission of a black body inversely with what quantity?

   ANSWER: TEMPERATURE

8. PHYSICS *Short Answer* Name this subset of fermions that do not interact via the strong interaction, have antiparticles that are only opposite in charge and number, and contain the set of neutral particles known as neutrinos.

   ANSWER: LEPTONS

The second example highlights an important writing style that, in my opinion, should be used more often in Science Bowl: pyramid-style tossups. Pyramid-style tossups generally have three to four clues, ordered in order of increasing easiness. For example, three clues about

dopamine are it is produced in the substantia nigra, it inhibits prolactin release in the pituitary gland, and individuals with low levels of it have Parkinson's disease. The easiest of these three clues is the Parkinson's disease, while the hardest is the location of its synthesis. The following question could be written:

9. BIOLOGY *Short Answer* Name the following neurotransmitter: this neurotransmitter is primarily produced by the substantia nigra and the vetral tegmental are. It also acts as a neurohormone released by the hypothalamus and functions in inhibiting the release of prolactin from the adenohypophysis. This neurotransmitter is associated with Parkinson's disease in individuals with low levels of it.

This is a writing style that Quiz Bowl tends to take to a new extreme, but should be used more in Science Bowl due to the way it rewards deeper knowledge. The National competition has few tossups of this type, but the frequency of pyramid-style tossups has been rising in recent years. Writing this style of question is most conducive to learning because of the amount of research involved in writing each question.

Bonus questions should be written identically to tossup questions, aside from a few small exceptions. Firstly, pyramid-style questions should never be written as a bonus. Because teams get to listen to the entire question before answering, the knowledge-rewarding aspect of the question is nullified. A general rule of thumb to follow when converting pyramid-style tossups to bonuses is to remove the giveaway clue. Secondly, calculation based bonus questions can be more difficult than their tossup counterparts because of the extra time given during bonuses. The best way to test if a calculation bonus is doable within 20 seconds is taking note of how long it takes you do to the calculation. As long as you can solve the problem in 20 to 25 seconds, the question should be fairly appropriate.

The best method, however, for improving your question writing, is to attend practice often and go to the Regional competition to hear official questions. Ideally, each packet that a player writes should be about 40% multiple choice and 60% short answer questions with the majority of the short answer questions being pseudo-multiple choice or pyramid-style. While this may not produce questions identical to the Regional and National competitions, it produces the most improvement in players all around. Evidence of this is the 2009 Mira Loma team, who had written a total of 150 packets over the course of the year, which is approximately one packet per week from each member between the start of the year and the National competition. This regimen not only produces players that have an impressive breadth of knowledge, it guarantees that your Science Bowl club will have plenty of questions for years to come.

Part Four: Forming a Competitive Team

A team led by a player that trains according to the methods detailed in the last two sections over the course of a year should be able to make serious headway at the National competition, and the team's chances only get better as more players adopt this regimen. However, in order to maximize their chances, a team must be willing to maximize the efficiency of their studying. The advice in this section is mostly directed towards team captains and coaches, but anyone who has an interest in the strategic aspects of Science Bowl will find useful information here.

Dividing Subjects.

At the time of writing this guide, there are six categories of questions in the National Science Bowl, all of which have varying amounts of synergy with each other. As a coach, you are responsible not only for picking the best players, but for picking a team that will overlap minimally. The reason that most mid-upper tier teams cannot break into the highest tier of competition is because their players have far too much overlap in their knowledge.

Ideally, a coach would like to see four strong players during tryouts with good breadth of knowledge, but they are slightly stronger than each other in different areas. Unfortunately, this situation is incredibly unlikely. This guide will discuss a realistic "best case" and "worst case" scenario that coaches will commonly see during the Science Bowl preseason and the best ways to transition out of these situations.

Most commonly, a good year will produce one generalist and two or three weaker subject-specific players. With some gentle urging, this combination of players is easily capable of placing within the top 16 teams at Nationals. The challenge lies within getting the players to maximize their practice efficiency.

The following table is the subject splits of a recent top tier team.

Player:	Captain	A1	A2	A3
Main Subject:	Biology	Earth and Space	Mathematics	Chemistry
Secondary Subjects:	Physics, Earth and Space, Energy	Physics, Math, Energy, Chemistry	Physics, Energy, Biology	Physics, Energy
Weak Subjects:	Math	Biology	Chemistry	Earth and Space

As you can see, this team shores up its weaknesses in physics and energy by having everyone study the two subjects on the side. At the same time, they have no overlap in their weaknesses or main subjects, resulting in a very strong team overall. The strongest players (Captain and A1) have the most responsibility in terms of knowledge breadth, while the other

two players are focused more on depth of knowledge. Every coach should aim to pick the four strongest members who all focus in different subject categories. If the team is going to have an alternate, the alternate MUST overlap completely with one of the other team members. Far too many teams delegate their least favorite subject to the alternate, only to never play their alternate during a round and give away free points. An ideal team should split their subjects in the following way:

Player:	Captain	A1	A2	A3
Main Subject:	Biology	Mathematics	Earth and Space	Chemistry
Secondary Subjects:	Chemistry, Earth and Space, Energy	Physics, Chemistry, Energy	Physics, Energy	Biology, Physics
Weak Subjects:	Math	Biology	Chemistry	Earth and Space

Essentially, any balanced team should never have any overlap in strongest subjects or weakest subjects. Ideally, the strongest, fastest players should be focusing in the "main trinity" of the Science Bowl subjects, biology, chemistry, and physics. Because most, if not all, competitors have been exposed to those three subjects, the only way to guarantee points from those questions is to designate your strongest team members to learn those subjects. The "peripheral" subjects of energy and the earth and space sciences are better designated to the slower players simply because more of the tossups in those subjects will be uncontested by the other team during buzzer races.

Strategy of Science Bowl.

The nature of any timed competition allows for some gamesmanship when it comes to making a comeback or protecting a lead. Furthermore, the consistency in style of multiple choice questions allows for knowledgeable players to score against an otherwise faster competition.

While the following tips may seem obvious, the rush of holding a seemingly commanding lead during competition has caused many teams to stop playing strategically in double elimination rounds. Firstly, if your team has a lead of 42 points or more during the second half of a round, stall during every single bonus. A 42 point lead can be overtaken only by a minimum of four questions, meaning that every second wasted during one of your team's bonuses is another second that the opposing team does not have to make up their lead. If you do not have a 42 point lead, however, stalling could enable your own defeat. Because momentum is such an important factor in Science Bowl, running down the clock when your team is just barely in the lead can backfire when the opposing team goes on a two or three question run.

Secondly, players can take advantage of multiple choice questions. If you are confident you know the wording of the answer, buzzing in after the first answer choice has been read gives a significant advantage. For example:

10. Earth and Space Science: Multiple Choice: Which of the following types of stars is commonly referred to as “metal free?”
    W. Population I star
    X. Population II star
    Y. Population III star
    Z. Population IV star
    ANSWER: Y – POPULATION III STAR

A player who knows that the answer is “Population III star” or some variation of the term can buzz in with confidence after the first answer choice has been read. Similarly, a player who knows that the first three answer choices are incorrect can buzz in and say, “Z.”

These maneuvers may seem risky to newer players, therefore requiring a lot of confidence with the buzzer and in your own knowledge to pull off. Playing riskily is a team attribute that becomes more and more important as the opposing teams get stronger and stronger. During the final few rounds at the National competition, it is plausible that the opposing teams have a knowledge pool just as wide and deep as you and your teammates. At that point, the only advantage that can be decisive is speed. Playing quickly, however, has risks. Admittedly, teams that refuse to play a risky, fast style have done very well in the past; most notably, the 2008 Thomas Jefferson High School for Science and Technology team which placed 3rd at the National competition played a slow, cautious style. They hit a wall against teams with risky play and large knowledge bases, however, ending their tournament run earlier than expected.

All of this advice may seem obvious to a veteran player, but many teams start to crumble during high pressure rounds and stop taking the risks they normally would. No matter what the circumstances, teams should play as quickly and as risky as they have practiced; any last second adjustments to play style will inevitably damage the strength of the team.

Conclusion

The guidelines detailed here are a good outline for any weak but dedicated players to build a well rounded set of skills and a wide knowledge base. Improvement at Science Bowl is at minimum a three to four month process, so do not be discouraged if results are not immediately apparent. However, through studying rigorously and regular practice, anyone can become a top tier player, capable of competing at a high level at the National competition. Here is a simplified guide to develop a strong foundation and build upon it as efficiently as possible:

- Pick one subject that the current A-team is weakest in and read the canon literature for it. Take notes if it helps you drill the material into your head, but be comfortable with quickly recalling the facts detailed in the book. The easiest way to do this is to write subject-specific questions as you read each chapter.
- Write one or two packet a week, slowly increasing the difficulty of the questions that you write. This will build a wide base of knowledge, enabling you to answer questions in every subject area.
- Practice actually playing Science Bowl as often as possible. Confidence behind the buzzer is something that cannot be built without frequent practice. Arrange your own practices outside of the Science Bowl club if you must, but experience has no substitute in Science Bowl.

These methods, given a receptive group of players, have been used transform a team from a middle tier Regionals team to a top 2 Nationals team in two months. Given a longer period of time, any player(s) with enough dedication can make the jump to the top tier of play using these methods.

Appendix A: Science Bowl Jargon

Parts of this guide are admittedly dense with jargon, so this section was added in an attempt to clear up some of the confusion. However, this appendix assumes that players have read the Science Bowl Rules on the Department of Energy NSB website, so terms like “tossup,” “bonus,” and “interrupt” will not be defined here.

Low tier team: A team that generally doesn’t manage to get out of the round robin rounds at Regionals. As a general rule, a team that doesn’t place in the top 4 at Regionals can be considered a low tier team.

Middle tier team: A team that generally places in the top 4 at Regionals, occasionally winning and making it to the round robin rounds at Nationals.

Mid-upper tier team: A team that makes it into the double elimination rounds at Nationals, but drops before making it to the top 4. However, there will always be some middle tier teams that manage to qualify for the double elimination rounds due to easier brackets or lucky games. Be careful when classifying these teams as mid-upper tier.

Top tier team: A top 4 team at the National competition.

Generalist play: A well rounded style that describes players who regularly score on tossups in every subject area.

Consistent play: A style that describes players whose knowledge is limited to one to three subjects, but they regularly score on tossups in those subject areas.

Risky play: Occasionally, players will interrupt on multiple choice tossups before they are completely sure of which choice is the correct answer. This can range from making an educated guess based on the writing style of the question to outright guessing. Because of the inherent risks associated with interrupting, this can be a very dangerous, yet very rewarding style to play when matched against a superior team.

Stalling: This is a tactic used to protect leads in the second half of a round. Stalling involves waiting until the timekeeper calls “5 seconds” before giving your answer during every bonus question.

Appendix B: Recent Science Bowl History

2010 National Science Bowl

1. North Carolina School of Science and Mathematics (Durham, North Carolina)
2. Mira Loma High School (Sacramento, California)
3. North Hollywood High School (North Hollywood, California)
4. Arcadia High School (Arcadia, California)

2009 National Science Bowl

1. Mira Loma High School (Sacramento, California)
2. Lexington High School (Lexington, Massachusetts)
3. Oak Ridge High School (Oak Ridge, Tennessee)
4. Santa Monica High School (Santa Monica, California)

2008 National Science Bowl

1. Santa Monica High School (Santa Monica, California)
2. Mira Loma High School (Sacramento, California)
3. Thomas Jefferson High School for Science and Technology (Alexandria, Virginia)
4. Fairview High School (Boulder, Colorado)

2007 National Science Bowl

1. Poudre High School (Fort Collins, Colorado)
2. State College Area High School (State College, Pennsylvania)
3. East Chapel Hill High School (Chapel Hill, North Carolina)
4. Miami Palmetto Senior High School (Pinecrest, Florida)

2006 National Science Bowl

1. State College Area High School (State College, Pennsylvania)
2. North Hollywood High School (North Hollywood, California)
3. Santa Monica High School (Santa Monica, California)
4. Albany High School (Albany, California)

2005 National Science Bowl

1. Thomas Jefferson High School for Science and Technology (Alexandria, Virginia)
2. Mission San Jose High School (Fremont, California)
3. George Walton Comprehensive High School (Marietta, Georgia)
4. Miami Palmetto Senior High School (Pinecrest, Florida)
5. Thomas S. Wootton High School (Rockville, Maryland)

2004 National Science Bowl

1. Thomas Jefferson High School for Science and Technology (Alexandria, Virginia)
2. A&M Consolidated High School (College Station, Texas)
3. Baton Rouge Magnet High School (Baton Rouge, Louisiana)
4. Montgomery Blair High School (Silver Spring, Maryland)