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NEWSLETTER

The Seven Biggest Mistakes People Make When Teaching Groups Of Kids About Rockets

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The Seven Biggest Mistakes People Make When Teaching Groups Of Kids About Rocketry.

By Tim Van Milligan

Here at Apogee Components, we deal with a lot of teachers and youth group instructors. So we see a lot of the problems that they encounter when they are teaching rocketry to their students. In this article, I thought I'd share with you the seven biggest problems I see people make, so that you can avoid them and end up having a great experience with rocketry.

Mistake 1: Using rocketry as an end-of-school-year activity instead of a beginning-of-the-school-year immersion project.

I would have to say that rocketry is the best teaching tool I have ever seen in my entire life. Nothing – I repeat – nothing, gets kids excited as rocketry! Want to argue with me about this? Then tell me something that gets both girls and boys as pumped up as rocketry. There is nothing—period! I can go to any park in America, and within 5 minutes of taking out a rocket, I'd have every kid in the park gathered around to see the launch. It is like being the Pied Piper; and you know what I'm talking about.

If I'm right about rocketry being the best thing ever invented to get kids excited, then think about what this means. You have this phenomenal tool to use to get students eager to come to school and learning the stuff that it takes to be successful in rocketry, and then simply ignoring it until the very end of the year. How dumb is that? Really—it is INSANE!

Let me tell you a secret that I learned at a writing workshop that I went to this past March. I paid $1,499.97 to attend this workshop, so I consider this to be worth a lot of money. In this economy when money is really tight and many people are desperate to get jobs, I'm really picky on where I spend my money. And I still cringed when I wrote that huge check to attend.

It is a good thing I got something out of it. And fortunately, it relates right to rocketry and why rocketry is so powerful in the classroom.

Here it is… *"People will only remember something* (such as an obtuse fact) *if there is an emotional component that their brain attaches to it."*

That's right. That is the most important thing I got from the workshop for my $1,500.

What does that mean? Let me give you an example.

If I say the color of the sky on the planet mars is red. That is a simple fact, right? But you probably won't remember it. But if I say that the color of the sky on the planet mars is the color of the rocks at Bryce Canyon in Utah. Now you'll remember the fact, because you may have vacationed at Bryce Canyon in the past, and you know that they are an awesome shade of red. Because you vacationed at the place, you have a lot of emotions tied to the national park. You'll now attach those emotions to the fact that I gave you about the color of the sky on mars. Forever and ever, you'll now always remember that the color of the sky on the planet mars is red.

And I'm sure you'll always remember the $1,499.97 secret I told you. Why? Because I intentionally tied the secret concept to emotions you already have. You already have fears and concerns about the current economy where people are desperate to get jobs (I'm sure you know people are in that situation, right?). Spending $1,499.97 to learn just one little secret may be insanity on my part, especially in this economy when it might be best to save every penny

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for a rainy day.

I did that emotional-attachment technique on purpose to make a point. I wanted you to remember that teaching technique. And here's why. I'll introduce to you a new fact (which I also want you to remember forever and ever): ***"Rocketry is packed with emotions."***

When you and your students build and fly rockets, you'll be experiencing a lot of emotions. Most of the emotions will be positive, like the feeling of achieving a fantastic flight. Maybe some will be negative, such as feeling frustrated when watching a rocket land hard and break a fin because the chute didn't come out. But the emotions are there. As a teacher, you will not have to contrive to spark the emotions, rocketry will do all the work for you!

The emotions created by flying rockets are so bloody powerful, I would be willing to bet money that you remember the first time you saw a model rocket take off. That is a common recollection that people tell me about all the time, so I know it is probably true for you too. Recreating those childhood emotions becomes a passion for people, which is why people always come back to the hobby when they are adults. And they want their kids to have those same emotions and experiences. And the cool thing is that it *always* works. The kids will remember it; and the cycle starts all over again.

Here's the key point: You now know that you can attach other facts on those emotions evoked by rocketry; and your students will always remember them. So what facts are you going to attach? How about the stuff you're teaching, like math and science concepts? Simple, right?

When you attach those concepts to emotions generated by rocketry, your students will soar in their schoolwork. They'll remember those facts forever. And what is more, they'll remember YOU forever, and how you introduced them to the fun of rocketry.

So use rocketry at the beginning of the year, and keep coming back to it over and over to reinforce the key lessons you are trying to teach them. And this is exceptionally easy with rocketry, because rocketry and the space program touch every single area of our life and every educational discipline.

Here's how you can come back to rocketry again and again. You could say "Remember when we flew model rockets and how *<insert the thing you learned>* . Well, we're going to expand on that concept and learn something very similar. *<insert what you're going to teach them>*."

See how easy and powerful this is? It is going to make being a teacher a lot easier for the rest of the school year.

Mistake 2: Ordering the cheapest rocket kits instead of the BEST rocket kits.

I know that teachers are on a really tight budget and have to make every penny count. I'm on a budget myself. But when a teacher calls us up and asks for the cheapest rocket kit, I feel really sad for the students. They are getting cheated out of a great experience.

Put yourself in this situation: "Imagine you are a rocket kit manufacturer. Now ask yourself, how would I make cheap rockets where the price is so low that it would attract the attention of teachers?" You're right. By reducing the quality of the components and having a minimalist approach to what you're going to provide the customer.

First of all, in terms of quality, you'll get what you pay for. You know what I'm talking about, don't you?

If you've read my book on how to build model rockets (www.ApogeeRockets.com/design_book.asp) , you know

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that I can take ordinary household items and turn them into great rockets. But actually, the true cost of those household-rockets is astronomical. *"How's that?"* you may ask. Because I have to put significantly more time into them just to make them look good. Ask yourself: "what is your time worth?" I put a pretty high price on my time, because it is the one commodity that I can't buy back at any price.

I can accomplish the same results in a much shorter time by starting with high quality parts. When I want to reduce the cost of a scratch-built rocket, I always start with good components like the ones we sell at Apogee Components. The same goes with kits. If the kit I build has good quality parts, it will go together faster and be a more enjoyable experience than a cheapy one with inferior materials.

Second, cheaper kits, in my opinion, are always a little bit harder to assemble. Here's why. In order to keep the price of the kit down, the manufacturer will want to have shorter instructions, because long and detailed instructions require more paper. And every sheet of paper in the kit adds to the price of the kit. Shorter instructions will be less detailed, and according to Murphy's Law, they will be deficient in the worst possible place (whatever that may be to your program).

In addition, many of the cheapest rocket kits use the Estes mini-size rocket engines. You can save money on manufacturing costs when the size of the rocket is minimized to practically nothing. And there is nothing wrong with that. And I love the mini-engines because they are a little cheaper, which is why we sell them.

But because they are so small, they are not well suited for kids. The dexterity skills required to put together a small rocket are considerable compared with a large rocket that has bigger parts. The younger the child, the bigger the parts need to be so they can hold them easier. That's why baby toys are often big and bulky, right?

By using a small rocket that is cheaper, you are actually making the assembly a lot harder and it is going to take longer to put it together.

Finally, a cheap kit will reduce the learning potential that you'll have with the rocket. Let me give you an extreme example. My nine-year old daughter (who knows all about model rockets since she often helps me build rockets) came home from school one day and said, "Dad, we're going to fly rockets at school this week." You could really see her beaming with anticipation and pride, because she thought that she was going to be really helpful to the

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teacher. She visualized that she was going to help teach the other kids in her class how to put the rockets together since she's done many on her own. I have to admit that I was a little bit proud of her myself, for the same reasons.

But she came home a few days later and I could see the disappointment written all over her face. "What happened? I asked. "Well, we didn't get to build *REAL* rockets." She said. "We made these silly rockets using a film canister and launched them with water and alka seltzer tablets."

"How well did they work?"

"They were awful," she said. "They went about three feet in the air."

"What did you learn from it?" I asked.

The answer? *Deafening silence…*

NASA pushes these toys on teachers and thinks they are doing them a favor because they cost practically nothing. But you get what you pay for. The students don't get anything from the experience because they have no emotion tied to it. It is just another silly work project that they are required to do, and then they go to the next boring one.

A reader, Thomas Kindig tells this teaching nightmare: "We coordinated a rocket build in six classrooms in a two day period. The mistake we made was to allow the MESA

program director to purchase the rockets. She did not buy the model we specified; instead buying that model for her own program and purchasing the cheapest model we have ever seen. The students saw the rockets as disposable. The failure rate was terrible."

Your students will come away with the same disappointing feelings when you hand them a cheap model rocket kit. And the learning will be diminished, and that is the most critical thing to keep in mind.

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For example, a cheap kit will almost always contain a simple streamer instead of a nice parachute. Now don't get me wrong; there is nothing wrong with using a streamer. But the students seem to learn more when they have to assemble a parachute and pack it properly into a rocket. And the emotions created by seeing a parachute deploy and fully blossom in the sky seem to be much more powerful than watching a streamer unfurl. As listed in mistake #1, I'm all for tapping into emotions; and the more powerful, the better.

So what is the best rocket?

Great question. It may be the cheapest one we sell. On the other hand, it could be the most expensive one on the planet. That leads us to Mistake #3.

Mistake 3: Not Knowing What Outcomes You Want The Students To Learn From Having Used Rocketry.

A lot of teachers start rocketry and don't have a map of where they want to end up. I suppose that is why so many teachers do rocketry as an end-of-year activity instead of incorporating it right into their regular curriculum.

My philosophy is to teach what you know (like math or science), and use rocketry as a tool to get the student's interest and emotional level really high.

I'm biased, since I have real-world experience having worked in the space industry launching satellites into earth orbit. So I know how rocketry touches every area of human life, and every school subject discipline. But I know that not everyone has this perspective. So I've written a report that shows how rocketry can be used in a number of ways in your classroom. There is now no excuse for not knowing what to teach about. You can read it at: www.apogeerockets.com/education/educational_projects.asp.

So getting to the question about what is the best rocket to get for your program; the answer gets much clearer once you decide what outcome you want the students to learn during the program. You'll look for a rocket that meets the requirements of your educational curriculum. I can't say that the process is easy for the first time rocket instructor; but if you need help, there are a lot of excellent clubs around the country that can give you assistance. And as a back-up plan, you can always call us here at Apogee Components. When you talk to us, we'll ask you some question about what you want to accomplish and how old the students are. And based on that, we'll try to give you a few age appropriate choices to pick from.

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Mistake 4: Not Having Rudimentary Knowledge About Rocketry

This mistake is actually pretty rare. Or it may be because the people that come to our website are a higher quality of rocketry instructor. Most people that come to our web site already have heard about us from some other people, so it is probable that they know all the basics stuff about rocketry.

I'm not saying you have to be a rocket scientist. But you should have some basic knowledge about rocketry before you start teaching it to your students. So to answer your question, I think every rocket instructor should know these things:

A. How rocket engines work (Basic terms like thrust, action/reaction and what causes the parachute to come out of the rocket).
B. Parts of a rocket and what their purpose is.
C. Phases of a rocket's flight
D. The nomenclature printed on rocket engines (example: "A8-3" versus a "C6-5")
E. How to launch a rocket.

If you are not up to speed, I have some good news for you. It is not hard to learn, and the information is readily available for no cost and at a million places on the internet. I prefer the Apogee Components web site, but again, I'm biased. A great place to start is our publication for teachers called the *Rocketry Reservoir.* It is a 103 page pdf document that you can download at: www.apogeerockets.com/Education_Pack.asp.

In as little as about an hour, you'll be knowledgeable enough to answer just about any questions your students throw at you. If you get questions that are over your head, please feel free to give us a call. We are your back-up resource for the information you and your students need about model rockets.

Mistake 5: Not Planning Enough Time During The Day To Build The Rockets

Richard Dierking, a reader of this newsletter concurs with this and writes "For me, the biggest mistake is not allowing enough time. Usually, event organizers don't know how much time it takes to build a model rocket and also have the time to answer questions about prep and launching model rockets. Now, I will not do a rocket building session without at least 90 minutes.

"The best technique I have found to make the best use of the limited time I have is to lead the group through the build, and not follow the written step-by-step direc-

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tions. Instead, I lead the group through the steps and using examples held up from participants. For example, I usually ask "can someone show me the engine mount tube and engine clip?"

Speaking of time, David Beeton makes this observation: "A big mistake that I made in the beginning was to assume that all the kids would be working hard all the time and that they would all be finished at the same time. So what do you do when some are finished and the slower ones are trying to get finished, and you need to spend some time helping them out?

"The trick is to have some worksheets ready for the faster ones to complete. I always get the kids to do some predictions on how they think their rocket will perform. They can also weigh the rockets and start to enter the data into a table that I have prepared. That table is also stored as a spreadsheet on a laptop computer. The spreadsheet calculates the theoretical height and speed. I know that Rocksim (www.ApogeeRockets.com/rocksim.asp) also does that, but not all schools can afford to get Rocksim just for that one day! Nearly all schools have a copy of MS Office or similar applications! For the younger students and kids, try printing off line drawings of rocket motors and rocket designs for them to color and turn into show-and-tell pictures for use later on."

Ken Schumacher offers this advice in regards to the building session. "You must coach and supervise the use of glues. We had some strange shaped nosecones and even tail fins due to kids using way too much plastic model cement to assemble kits. And MOST IMPORTANT: Be very strict in regards to launch safety. The kids try to test boundaries. They must be clear that safety rules are not the limits to play with." That is really good advice.

Mistake 6: Not building the rocket prior to the students building it.

A rocket is a rocket; they all build basically the same, right? If so, then you'll save some time by not building it prior to the students building it.

But there is one fatal flaw in this. You've assumed that the manufacturer is 100 percent perfect and doesn't make any mistakes. But I have a secret for you. Us manufacturers are not perfect and we do make mistakes in the instructions. So don't assume that the students can make heads or tails out of the written instructions that come with the kit.

You know your students better than anyone. If you can build the rocket kit by following the instructions, then it is likely that your students will be able too. But if you don't go through the process and the students can't figure out from the instructions what the manufacturer intended, then things are going to come to a screeching halt. You may be shut down for an entire day.

All the "time" you thought you saved by not building the kit ahead of time will have been wasted. It will cost you

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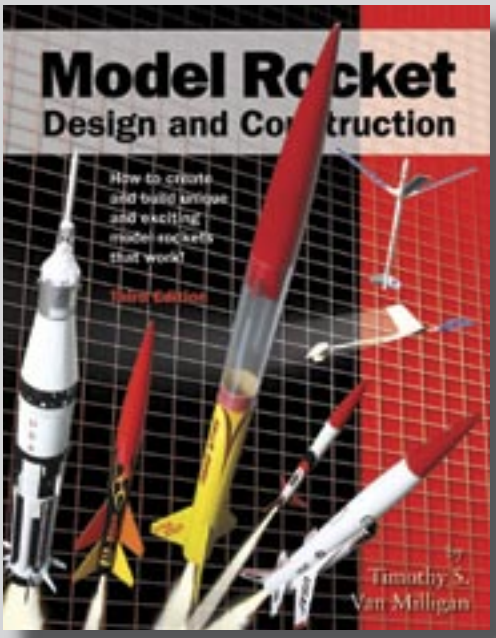

Model Rocket Design and Construction

By Timothy S. Van Milligan

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three or four times as much time and aggravation when the students are doing the building. And besides that, the students are going to have a diminished opinion of you for picking out a kit that they can't build.

Part B of this mistake is not having all the construction supplies (like glue, hobby knives, and sandpaper) on hand when the students are ready to build. Each kit has its own requirements, and often teachers think that if they've done one rocket in the past that they have everything they need. But that is not necessarily the case. A kit may need something very specialized that you didn't uncover because you didn't build the rocket in advance.

Part C of this mistake is not checking to see if you have all the launch supplies you will need. Many people forget to order the rocket motors to go with the kit they are giving the students. Certainly this can be avoided by simply going down the list of required launch supplies when you place your order. If your current vendor doesn't make this information available, then I suggest you find a new supplier. They are doing you a disservice and adding to the headache that is going to arrive on the day you discover you're missing the motors and launch pads.

Mistake 7: Waiting to the last second to place your order for supplies

Since we perform shipping miracles on a daily basis, I'm beginning to wonder if we are training our customers to wait until the last possible second to place their orders for supplies. Hopefully not.

It is a lot less stressful if you order at least one month ahead of time. That is both for you and for your supplier *(have you seen how grey my hair has been getting lately?)*. You'll save some money too. If you have to scramble at the last moment to get supplies, you'll probably be sending extra money for express shipping.

I know that it is unavoidable in a lot of situations, such as being told by a supervisor that you will be doing the rocket building session a couple days before the event. But do your best to order with as much lead time as possible.

I'm always giving to customers more than they expect, so you're getting a bonus tip here. Is that OK with you?

Mistake 8: Not allowing enough time to be flexible on when to fly the rockets.

Because teachers often wait until the end of the school year to build and fly rockets, they often run short on available time when it comes to actually launching them. I hear

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a lot of times: "I have a launch on Friday." When I hear that I cringe.

Why? Because they are more opt to take larger risks just to get the rockets in the air. One of the biggest decisions you have to make is "Is it safe to fly this rocket today?"

A few years ago, a school teacher here in Colorado Springs had this very situation. On the last day of school, they wanted to fly rockets. The sky was blue, but the wind was howling. They decided to launch anyway. The result was a four-acre grass fire.

If you don't have any padding built into the schedule, you're more opt to take extreme risks just to appease the students' desires to see their rocket go up into the air. This is another reason I recommend that rocketry be done at the beginning of the school year or at the beginning of the camp than towards the end. We all want to see a successful launch, but being safe is even more important.

Conclusion

Now that you know the top seven mistakes (plus the bonus one), you'd be right if you're thinking "Man, these are very easy to avoid." They ARE easy to avoid. All it takes is a little preparation. It is really that simple.

Being prepared is something I try to stress over and over with rocketeers. Getting them to heed my concerns is another thing. But I'm sure you're a lot different. If you weren't a little bit better than the average instructor, you wouldn't even be reading this article, right?

I know I'm right, and you are a superior instructor. And so now I'm wondering why I even bothered to write this since I'm preaching to the choir. Maybe I'm the insane one.

About The Author:

Tim Van Milligan (a.k.a. "Mr. Rocket") is a real rocket scientist who likes helping out other rocketeers. Before he started writing articles and books about rocketry, he worked on the Delta II rocket that launched satellites into orbit. He has a B.S. in Aeronautical Engineering from Embry-Riddle Aeronautical University in Daytona Beach, Florida, and has worked toward a M.S. in Space Technology from the Florida Institute of Technology in Melbourne, Florida. Currently, he is the owner of Apogee Components (http://www.apogeerockets.com) and the curator of the rocketry education web site: http://www.apogeerockets.com/education/. He is also the author of the books: *"Model Rocket Design and Construction," "69 Simple Science Fair Projects with Model Rockets: Aeronautics"* and publisher of a FREE e-zine newsletter about model rockets. You can subscribe to the e-zine at the Apogee Components web site or by sending an e-mail to: ezine@apogeerockets.com with "SUB-