THE Science Teacher
September 2002 | Vol. 69 | No. 6

Stepping into the Classroom

Helping teachers survive their first years on the job

NATIONAL SCIENCE TEACHERS ASSOCIATION NSTA

FIRST

By Lynn Hensley

The first year in the classroom is probably the most challenging of a science teacher's career. While many science and education classes are offered in college, they do not always teach the basics of getting started. Not only does the new teacher have to worry about presenting the curriculum and meeting state benchmarks, but there are day-to-day issues as well. The learning curve is steep and fast, and some teachers feel completely overwhelmed just on the first day. This article presents tips, tricks, and suggestions for getting through the first few weeks, staying organized, and keeping things interesting.

Starting off on the right foot

The first week of school sets the tone for the entire year. That is why it is important for teachers to present a list of the rules to students first thing. New teachers always can lighten up later in the year, but it is much harder to rein students in after being easygoing at the start. Teachers can briefly discuss the rules with students and have parents sign them so there are no surprises later on. Students should keep the rules in the front of their notebook as a constant reminder.

In addition to a list of rules, an information sheet that students complete with their name, parent(s) name, address, home and work phone numbers, and e-mail is a valuable teacher tool. I always leave space on the sheet for students to state special needs, seating arrangements, sensitivities to strong chemical smells, allergies, reactions, or ailments. The main office usually passes this information along to teachers if parents put it on the emergency card, but it is smart to have it from day one.

During the first couple of weeks and throughout the school year, teachers must model the behavior expected from students by using appropriate language and addressing inappropriate language and behavior. Teachers should warn students when they break rules the first time and enforce consequences the next.

That first week or two of school can be pretty rough: memorizing names and faces, trying to keep order in the room, filling out paperwork properly, learning who to ask for what, and teaching bell to bell. For learning names and faces, I find it helps to arrange tiny, self-stick notes on

YEAR 101

Tips and tricks for a successful start in the classroom

a sheet of paper as a seating chart. I then write the students' names on the notes and reposition them as changes to the seating arrangements are made. I keep the chart in a plastic sleeve to write on and wipe off comments or participation points.

Get organized!

Being organized is probably the best advice for any new teacher. Precise records of student progress, behavior problems, and parent contact makes conversations with parents easier and provides good background material in case an administrator has to get involved.

Creating an organized process for collecting, sorting, and correcting homework each day can also make life much easier! Some teachers walk from desk to desk at the beginning of class to check on completed assignments. They then take time to go over the right answers. This maximizes class time and works as a review or introduction for the next lesson.

Notes in a lesson plan book about a lesson or lab can be used as a reference for the following year. The notes provide valuable feedback when it comes

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Safety is imperative. Teachers must model proper lab techniques by enforcing the use of goggles.

to deciding how to change or modify a lesson plan to make it better. A planner or a "to-do" list also helps prioritize tasks and reminds teachers what copies need to be done for the next couple of days, which lab equipment to take out, or what solutions need to be made. The best time to prepare a "to-do" list is during a prep hour or before and after school.

Large three-ring binders and dividers for each semester and each class are another useful tool. They can be organized by unit or chapter, depending on the class, and contain notes for lecture, originals for copying, and keys for all worksheets, labs, quizzes, and tests. This makes it easy to find things the following year.

Engaging the students

Once organized, the next step for teachers is to capture students' attention. A variety of activities the first few days helps get students interested and excited about class. For example, I do a demonstration using a plastic sandwich bag filled with calcium chloride, baking soda, phenol red, and water. Students see how the color changes as the bag expands and feel the temperature change as well. I then ask them to write down observations to prepare them for an activity making slime with glue, water, and borax.

By keeping lectures and notes short, teachers can gauge what information students are getting and what they do not understand. This allows students to comfortably participate and ask questions. After the slime demonstration, I point out that chemistry is part of everything in the world and is used everyday. Students see how many parts of their life involve science concepts and why chemistry and science are important. They can answer some questions, such as "How do you use chemistry in your everyday life?" and "Why did you take this class?" A teacher learns more about students this way and can choose examples and analogies students relate to throughout the year.

Labs, activities, and safety

Another way to keep students engaged, on-task, and excited about the course is with demonstrations, activities, and labs—all excellent ways to help teach and reinforce concepts. During demonstrations, students can record observations and answer a few questions to check for understanding. When students write about the demonstration, they improve observation skills, make a connection between the demostration and the concept, and practice technical writing.

The difference between an activity and a lab in my own classroom is the part of the room where it takes place. For example, an activity that includes students using molecular model kits at their desk does not require goggles. However, goggles are required for a laboratory that takes place in the desig-

By attending sporting events, plays, musicals, and dances, teachers let students know they are interested in what goes on outside the classroom.

nated lab area. Safety is imperative. Teachers must model proper lab techniques by enforcing the use of goggles. The template for a lab safety contract, signed by students and parents, is available either though the school district or from a catalog or lab manual. Early in the year, students should learn how to read chemical labels and a Material Safety Data Sheet. Teachers can demonstrate what a strong acid does to an egg white to simulate what would happen if acid entered the eye. This is a great opportunity for teachers to locate and demonstrate the eyewash station, shower, and other safety equipment. A handy bucket and small dustpan are great for picking up broken glass. Teachers should always clean up broken glass themselves.

Additional safety activities include giving a lab safety quiz covering lab rules and showing a video on safety in the lab. Laboratory handbooks that show step-by-step procedures for a variety of techniques are great for teachers without a lot of lab experience.

Teachers can leave out the equipment and chemicals from a lab for a couple of days. Students need to know they have limited time to make up missed labs, and teachers should provide a couple of options for students to complete them. Keeping chemicals and equipment set up longer than necessary leads to broken equipment and a disorganized, cluttered lab area.

A support system

The best place to turn for expert "tricks of the trade" is a mentor. Ideally, a mentor is someone the new teacher meets with every week to talk about the upcoming unit or chapter, and discuss how the last one went. Mentors can provide helpful advice for labs, demonstrations, and activities that correspond with the unit. They also can point to equipment location and the best way to explain a particular concept. Department members often share copies of their labs, worksheets, and tests. New teachers should not be afraid to reach out for help from colleagues. The best time to run ideas by colleagues is between classes.

Learning outside the classroom

Many districts provide professional development courses for teachers throughout the year and offer specific ones for new teachers. While these are very beneficial, local conferences or summer workshops are great places to meet other teachers and hear what works and what doesn't. For instance, my best demonstrations, labs, and ideas come from colleagues and other science teachers. Attending conferences provides a chance to network, meet vendors, and get catalogs. Many of the summer workshops are sponsored by corporations or universities, so there is a possibility of receiving free classroom materials or even free graduate credits.

Have fun and get involved!

As a first-year teacher, time is precious and free time is a commodity, but new teachers should jump right into the school scene and attend a few after-school activities. By attending sporting events, plays, musicals, and a couple of dances, teachers let students know they are interested in what goes on outside the classroom. It usually takes a year or two to establish a reputation, but there may be fewer behavioral issues with students who see teachers outside the classroom. Aside from helping to reduce classroom discipline problems, administrators also appreciate the effort.

The first year of teaching is tough, and for new teachers, especially, everything will *not* turn out the way it was intended. New teachers should continue to try their best and not get frustrated. To avoid becoming overwhelmed, it might help for new teachers to choose just one or two things to focus on improving, such as lesson plans or classroom procedures. The following year they could pick a few other things to focus on. In the end, every teacher has to figure out what works best for them and know they are not alone!

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Sink or Swim

Jeanne Endrikat

Five lifelines help new teachers stay afloat

New teachers often are given the most preparations, classroom moves, and demanding students. The rationale behind this is more experienced teachers "have done their time," and therefore should be "promoted" to better students, newer equipment, and their own classrooms. In addition, new teachers are sometimes added to the roster at the last minute and never have a chance to tour the school and connect with colleagues. Bewildered and overwhelmed, no wonder new teachers often flounder and parents express concerns!

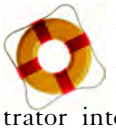
Frustrated and stressed new teachers can create unproductive and unhappy science departments. Not only does the new teacher struggle, but also the science team is pulled down with the effort to keep the beginning teacher afloat. These overstressed teachers have trouble planning if most of their free time is used to travel from room to room, set up activities, and find supplies. Instead of making creative plans they can use, new teachers sometimes resort to using standard worksheets and boring seatwork activities, or lecturing.

The competition for good teachers is tough, but making conditions favorable will help recruit stronger teachers. The department will run more effectively if new teachers are nurtured and eased into the school.

The background new teachers bring to the job also is important. Part of their success depends on their knowledge base and teacher training courses. In most cases, colleges are doing a great job of preparing teachers for classroom challenges and day-to-day interactions with colleagues, administrators, and parents.

A beginning teacher also needs to have patience, creativity, and flexibility. Unrealistic preconceptions can jeopardize their success. Many people do not realize the time investment needed during a workday. The following are five commonsense lifelines that veteran teachers and department chairs can give new science teachers to help them get off to a good start.

Lifeline 1: A good match



More of a new teacher's questions are anticipated and answered in the interview process if the department chair and science administrator interview the candidate together. They should show the candidate books and classrooms that will be used, describe how the school is set up, and discuss how the science department operates. Interviewers must be open and candid to give the new teacher a realistic picture of the teaching environment and administrative decision-making process. The candidate's style should complement the school's environment. For example, not everyone fits into a large school or one with many special-needs students. Some teachers don't like the constraints of working in a team.

Lifeline 2: Warm and welcoming

Once the interview is complete, interviewers should follow up with a phone call or e-mail to see if the candidate has any more questions or needs clarification. Once a new teacher is hired, administrators should make them feel welcome by inviting them to tour the building and meet teaching colleagues. New recruits should know the location of the teachers' workroom, library, and copy room. Another idea is taking them to lunch and giving them books, supplies, and their schedule to start planning.

Lifeline 3: A supportive schedule

New teachers need a schedule that allows them to thrive. If novices teach all classes in the same room, they can avoid moving equipment. They should be assigned standard classes, not special-needs or highly demanding classes. As new teachers start out, the department must allow them time to adjust. Experienced teachers are assigned harder tasks because they are better equipped to deal with them.

Lifeline 4: Safety in numbers

Our school is very large with about 22 teachers in the high school science department alone. For efficiency and communication, teachers are divided into teams of the same science subject matter. As a team, teachers agree on general grading methods, overall policies, and a final exam. This provides cohesiveness for students who need to switch classes in the middle of the year and offers support for teachers when parents question a particular policy. From a department point of view, the administration is reasonably assured that the necessary science content is covered.

A team is also great support for new teachers. Instead of inventing everything from scratch, teams share activities, labs, tests, and quizzes. The team activities are time-tested and fine-tuned for success! When new activities are needed, the workload is spread among several on the team. A new teacher can bring fresh ideas and invigorate the group. Most teams evaluate the success of activities, update files frequently, and store files on a disk—members have their own disk copy at the end of each year. If the new teacher becomes ill during the year, the team can touch base with the substitute to ensure classroom activities proceed smoothly. Science content and methodology become stronger, new teachers feel like they belong, and ultimately students benefit. Many of our beginning teachers have commented that being part of a structured team their first year helped them tremendously.

Lifeline 5: School and countywide support

Our county has new teachers arrive a day before experienced teachers to receive orientation. They are introduced to the school superintendent and important county policies. During the first year, new teachers take a course that meets three days before school starts, and then once a month for the rest of the year. The course provides an opportunity to share experiences at various schools and compare notes.

As a cooperative effort between the school and county, a mentor teacher is assigned to the new teacher. This veteran provides encouragement, answers questions, and shows the new teacher how to follow procedures within the school and county. Many professional development courses that enhance teaching and technology skills also are offered throughout the year for all teachers.

With all the lifelines in place, a new science teacher no longer has to flounder in the beginning sea of teaching. Looking back, veteran teachers probably wish they had access to all of these lifelines at the beginning of their career!

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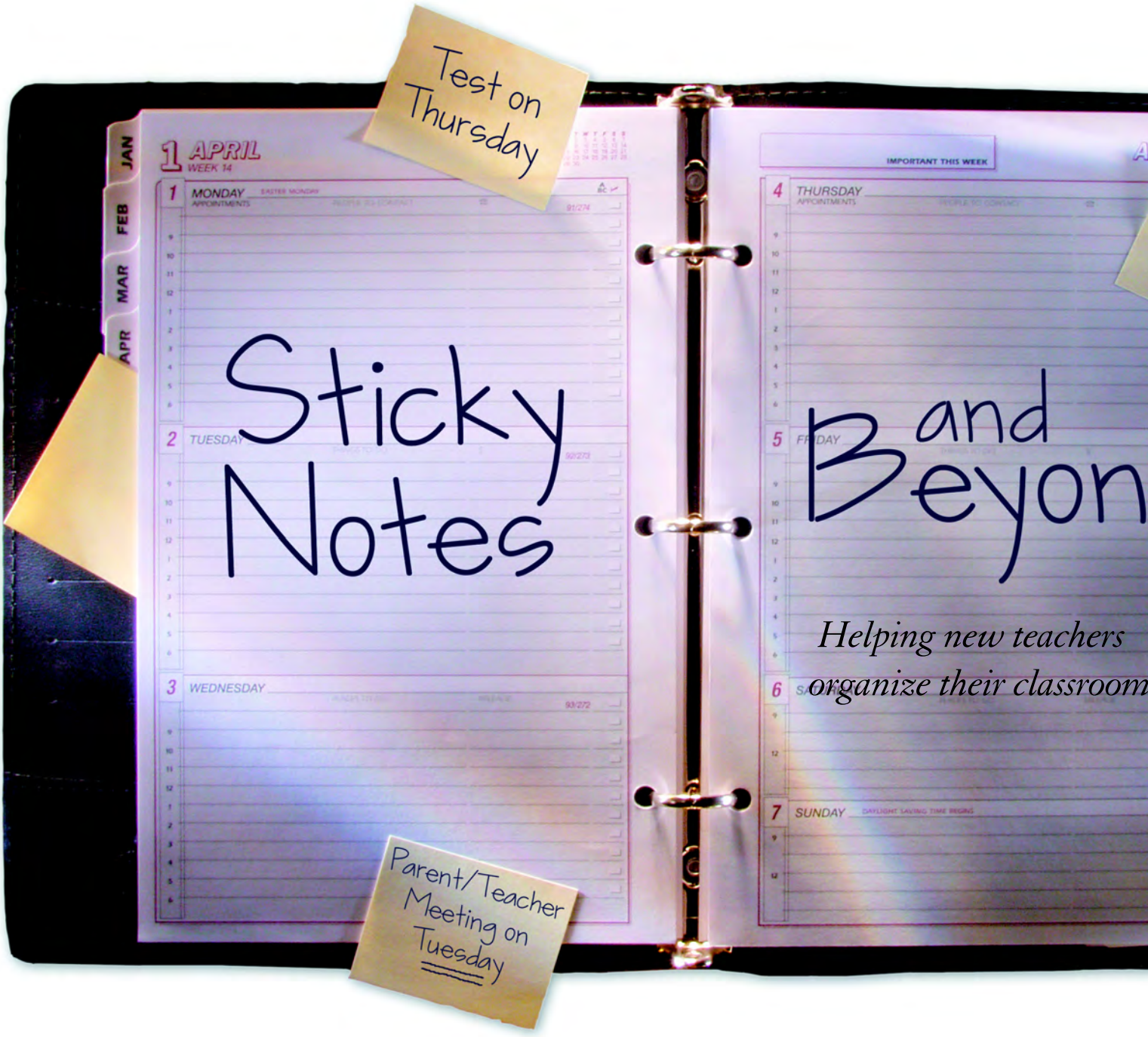
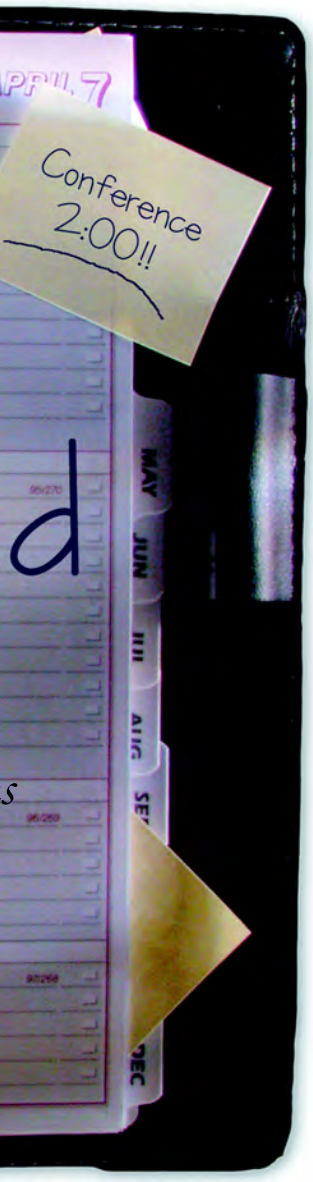


Sticky Notes and Beyond

Helping new teachers organize their classroom

Alison Maes

What does it take to be successful in those first few years as a science teacher? Sticky notes. There are so many things to remember, questions to ask, and so little time that teachers' desks, cars, and pockets often are full of sticky notes. Although sticky notes still adorn my desk and occasionally turn up in my laundry, through years of teaching I finally have developed an organized system that works for me.



New teachers often are driven by a desire to be creative, work hard, and build an inviting learning environment. Their first week teaching is exciting and a bit nerve-racking. Soon thereafter, they inevitably become overwhelmed with the minutia associated with everyday life as a teacher. Seating charts, files and papers, meetings, lessons, and supplies dominate the mind of what was once a young, innovative teacher. In addition to the technicalities, there are all of the unknowns. They not only need help with content guidelines and creative ideas but also require organization basics and preparation techniques not taught in college.

Successful learning environments thrive in organized classrooms. Organization aids the new teacher in everyday instruction, and also provides stability for the students. The following is a rundown of organizational tips that can replace at least some of a teacher's reliance on small squares of paper. Organization, similar to teaching, is an individualized endeavor, and these techniques will not work for everyone. Numerous methods can be tailored to fit individual needs.

What's happening today?

One of the best ways to immediately establish a sense of organization is to write out the daily agenda on the board for students to see as soon as they enter the room. It helps to have an agenda for each subject taught. PowerPoint presentations also can be used for this same purpose. At the end of each day, teachers should write out the daily agenda for the following school day to focus on what needs to be prepared.

Everyone have a seat

Teachers should never underestimate the value of a seating chart. I find it useful to keep one on hand at all times (Figure 1) and some schools require them. Supplies needed for the seating chart I use include a roll of magnetic tape, price stickers, a thin sheet of steel, and an equal size sheet of transparent resinous material. The magnetic tape is cut into 2 cm x 2 cm pieces, and a price sticker is placed on the sticky side of each magnet. On the first day of class, each student's first and last name is written on the price sticker and the magnets are arranged on the sheet of steel (approximately 15 cm x 95 cm). I put the magnets for first period on the left-hand portion of the steel, and each period after that to the right of the period that precedes it. I also place a clear piece of transparent resinous material (approxi-

Successful learning environments thrive in organized classrooms.

FIGURE 1

Magnetic seating chart.

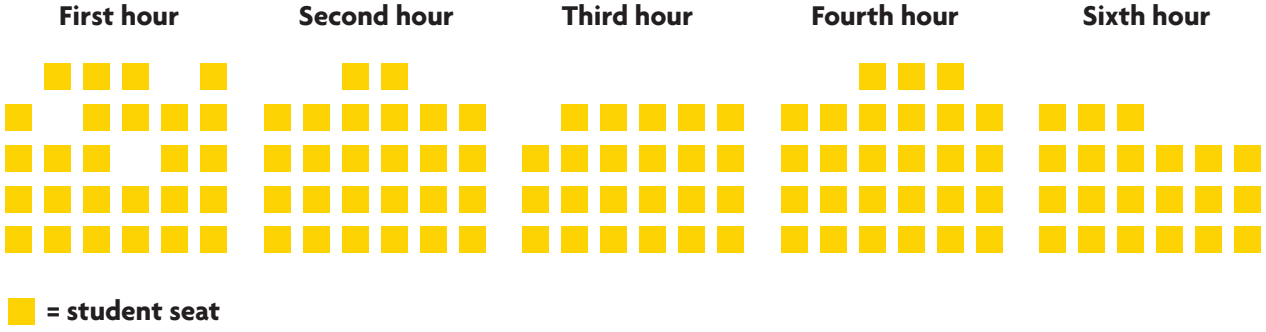
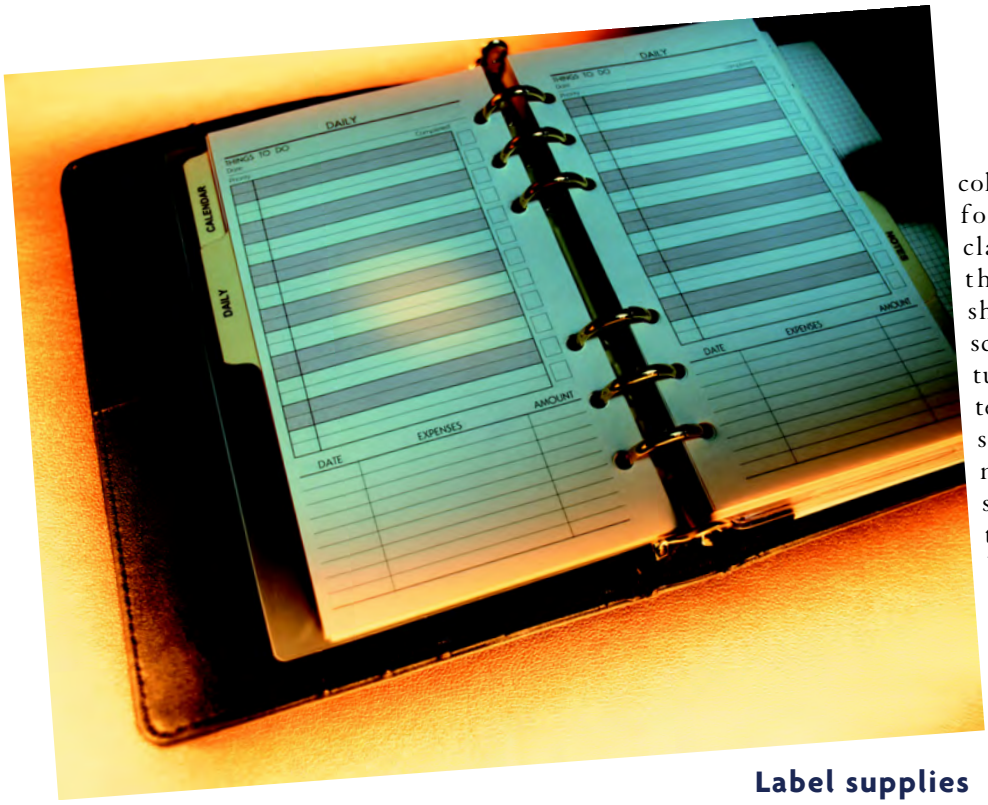


FIGURE 2

Possible file ideas.

File type	Description
Worksheets	Different colored file stickers can be used to differentiate between classes. Jot down any notes to remember on the outside of the file folder.
Unit files	Create a file for each unit taught and any possible subjects that may be taught or be of interest. In each file place collected activities, demos, labs, alternative assessment ideas, etc., for future use. Collect ideas from periodicals such as *The Science Teacher,* Internet resources, and text materials.
Committee	A file for each committee.
Inventory	A copy of all equipment in the science room. Include model numbers and quantities.
Science orders	A running list of items to be ordered during the purchase period for the district. Check off orders as they arrive. Postcards for shipment dates of live specimens.
Quotes	Collect quotes from periodicals, websites, and reference books. File quotes according to topics taught. Use quotes to introduce new topics in discussions. Allow students to interpret quotes and develop higher-level thinking skills. Write the date next to the quote each time that it is used so that it won't be repeated in the same class.
Emergency substitute plans	Generic, scientific method worksheets. Generic, engaging science video worksheets. General interest, science articles with corresponding worksheets.
Videos	Catalogue all videos under topic names with short descriptions. Copies of downloaded schedules for the seasons of science television shows such as *Assignment Discovery* and *Scientific American Frontiers.*
Forms	School forms for books, disciplinary actions, field trips, etc.
Articles	Create a file for each unit taught and any possible subjects that may be taught or be of interest. In each file place collected articles for future use. Collect articles from periodicals, newspapers, and the Internet.
Cartoons	Collect cartoons that include science content. Excellent sources include *The Far Side, Calvin and Hobbes,* and newspaper editorial cartoons. File the cartoons according to topics taught.



mately 15 cm x 95 cm) over the magnets. A grease pencil works well for marking absences and tardies on the transparent resinous material. At the end of the day, attendance is transferred to an attendance book.

Once established, it is easy to make changes to the seating chart. It can also be used in a variety of ways. Different colored price stickers can be used on the magnets to designate lab partners, cooperative learning groups, or special-needs students. The seating charts also are beneficial for substitute teachers, who can easily take attendance and identify names of students. Many schools now take all attendance each hour on a computer for immediate office use, but this seating chart can still be used for organizational purposes.

Document plans

Each week in a plan book, I organize for the next five days of teaching by putting check marks next to all parts of a lesson for which the materials and copies are prepared. I make note of anything that is needed for lessons; when they are complete, I write down any comments about how to change the lesson next time around. These notes aid in planning lessons for the following year.

File, file, file!

In my earlier years of teaching, I clipped and copied every activity, article, or cartoon that I thought might be useful at some point in my career. I had become a pack rat and could never find the specific clipping I was looking for. While I still continue to collect, I now file everything systematically so I can easily retrieve that one item I'm looking for (Figure 2).

It helps to keep files for all standard teacher papers, such as worksheets, articles, and forms. Use colored file labels and colored file folders to designate different classes or topics. In addition to these standard files, teachers should keep files for inventory, science orders, emergency substitutes, and quotes. Quotes can often be used to start class discussions. For example, scientist and mathematician Henri Poincaré stated, "Science is built of facts the way a house is built of bricks; but an accumulation of facts is no more a science than a pile of bricks is a house (Rawson, 1986). This is a great way to start a discussion at the beginning of a new school year.

Label supplies

Many basic supplies (Figure 3) can be purchased at dollar stores or from house and estate sales and stored in shoeboxes or plastic storage boxes. A label maker can be purchased inexpensively at an office supply store and be used to label all storage boxes.

FIGURE 3

Possible basic supplies list.

- First aid kit
- Glue guns and glue sticks
- Meter sticks
- Class set of masking tape
- String
- Straws
- Clay
- Plastic bowls
- Paper cups
- Paper lunch bags
- Sticky notes
- Wax pencils
- Stopwatches
- Label maker
- Sponges
- Construction paper
- Class set of scissors
- Crazy glue
- Class set of thick markers
- Class set of thin markers
- Class set of cellophane tape
- Rubber bands
- Sealable plastic bags
- Paper plates
- Plastic spoons, knives, and forks
- Shoe boxes
- Set of tools
- Exacto knives
- Batteries
- Safety pins, needle, and thread
- Assorted envelopes
- Plaster of paris
- Tweezers

FIGURE 4

Prompts for possible questions to ask.

- Duties beyond teaching
- Lunch storage and purchase
- Parent-teacher conferences
- Copy machine procedures
- School assembly procedures
- School cancellation notification
- Arrangements for substitutes
- Room repairs and maintenance
- Student attendance policies
- Evaluation process for teachers
- Professional development policies
- Science teacher conferences
- Mandatory meetings schedule
- School hours for weekends and vacations
- Classroom usage by other teachers or programs
- Teacher parking
- Lunch schedule
- Report cards
- Half day schedule
- Field trip policies
- Technology usage
- School map
- Fire alarm procedures
- Emergency procedures

Don't be afraid to ask

A large part of being organized is being prepared. The more prepared teachers are, the more confident they are, and the more confident students will be in that teacher. An important part of being prepared is asking the questions that veteran teachers take for granted. A new teacher in a new district often is just attempting to make it day to day, and events, like schoolwide assemblies and parent-teacher conferences, are the least of their daily concerns. That is, of course, until an assembly is scheduled, and the teacher has no idea how to find the auditorium.

The questions that need to be asked can vary greatly from teacher to teacher. A list of prompts for possible questions is given in Figure 4. No question is too simple. Seasoned teachers can provide great stories about waiting to meet parents for parent-teacher conferences in their classrooms while the conferences were being held in the gym, or how they got lost on the way to their own room the first day of school. For these reasons, most veteran teachers are happy to answer any and all questions.

As the school year draws to an end, new teachers will have developed their own methods of organization, collected more "stuff" than they ever thought possible, and answered questions they never dreamed would be asked. Organization techniques, like teaching techniques, will change and improve with experience. Veteran teachers have created systems for organization that have proven effective. Though sticky notes may still be prevalent in the classroom of veteran teachers, some of the teachers now have organization hints to pass on to new teachers of the future.

MIKE OLLIVER

Acknowledgment

John Bassier, science department chairperson at Ferndale High School and my mentor and friend, created the design of the magnetic seating chart.

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With a Little Help *from my* Friends

Melanie C. Melancon

First-year teachers benefit from an induction program

As a first-year science teacher in a rural area, I have faced numerous challenges. Thankfully, though, my school district offers an innovative teacher induction program designed especially for first-year teachers and those new to the county. Program participants meet on a monthly basis during the school year and—with the help of veteran teachers and school officials—share ideas on how to grow, develop, and improve. The result is a valuable support system that offers mentorship along with the rare opportunity to interact with colleagues.

A familiar face

The schools in my county do not rank among the top in the state, and teacher pay is not the most outstanding. Because of these factors, combined with other issues in education, such as accountability and increased responsibilities, the county has difficulty retaining teachers. Meanwhile, at faculty meetings and in system newsletters, we are constantly reminded that students crave continuity and predictability and fare better with familiar teachers than with new faces each year. That's why the county implemented the teacher induction program, a strategy aimed at increasing retention among its newest recruits. The idea is to make teachers feel comfortable, welcome, and prepared so they will be

MIKE OLLIVER

Starting with H_2O

One of the most challenging aspects of teaching is making a firm impression on the first day regarding discipline and classroom management, while also emphasizing a comfortable environment where science is relevant. To help establish this, I developed a theme centered on water that can be revisited throughout the year.

Water is familiar to students, regardless of their scientific background. This simple association can ease a student's transition into high school science. Water is revisited in science lessons throughout the year (for example, bonding, polar molecules, compounds, solutions, cells); therefore, this introduction sets the stage for many lessons to come.

To begin, the teacher should start off the first day by explaining rules and procedures; move into expectations, course objectives, and relevant standards; and then introduce the topic of water. I usually discuss how much the theme will be revisited throughout the year. The next step for the teacher is to create a concept map on the board and ask students to state everything they already know about the word *water*. The teacher writes everything down on the board. This discussion serves two purposes—it reinforces the idea that class participation is expected and provides an understanding of students' prior scientific knowledge and vocabulary. If they recognize that H_2O is water, the teacher should reward them verbally for already knowing a chemical formula.

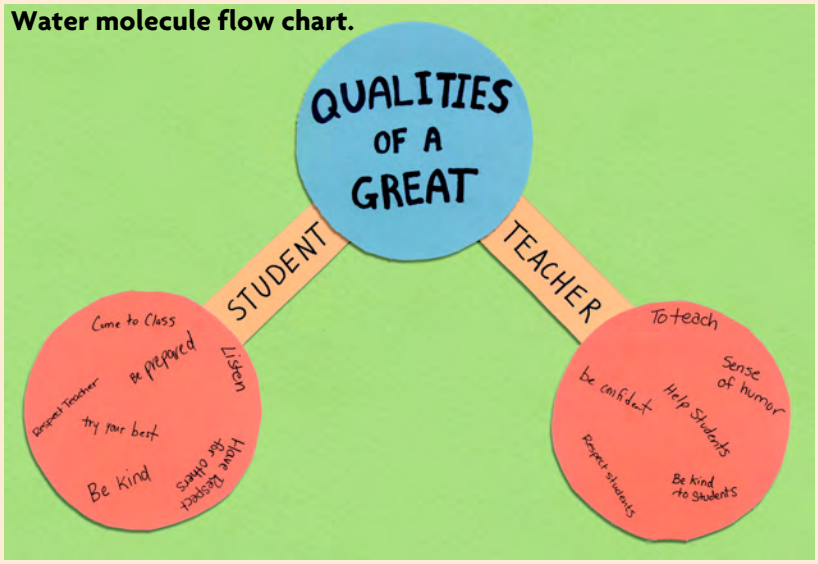
At this point the prepared materials can be introduced:

- Three circles—two smaller circles of the same color, one larger circle of a second color
- Two slim rectangles of a third color.

The teacher now proposes a challenge (not exactly related to water) by asking students to consider the following questions: "What does it mean to be a good student?" and "What are the qualities of a good teacher?" After a moment, students should write characteristics of a good teacher in one small circle and characteristics of a good student in the other small circle. Common responses for qualities of a good student include: pays attention in class, does homework, listens to teacher, is respectful, and wants to learn. Example replies for qualities of a good teacher are: respects students, smiles, makes learning fun, challenges students, and of course, doesn't give a lot of homework. Teachers need to encourage students to be honest but realistic in their responses. When everyone has written a response in each circle, the teacher asks students to think about how these three circles can connect to the theme of water. After some discussion and hints about how many atoms are in a water molecule, students determine how to create a water molecule out of the three circles (Figure 1). The large circle represents the oxygen atom; it contains the phrase "Qualities of a great." The two rectangles represent the bonds that hold the atoms together; one has the word "teacher" and the other "student." The two smaller circles represent the hydrogen atoms; these contain students' responses. Students help put the molecule together on a bulletin board, which now reads like a flow chart and is filled with examples of qualities of good teachers and students.

The teacher can wrap up the activity by re-emphasizing the significance of water and how it will come up several times throughout the course. The result is a student-centered display that can be added to during the year, a nonintimidating introduction to science, a chance to make each one think about being a good student, and the opportunity to see what students expect from a teacher.

FIGURE 1



Water molecule flow chart.

more inclined to stay within the county the following school year. A well-developed teacher induction program is one way to keep teachers happy, and happy teachers are more likely to stay where they are.

The program

While most districts cannot meet all the demands of its new teachers, the induction program is a good starting point toward increasing retention. The plan is simple. Once a month, new teachers meet at the high school for an hour after school. Each month the topic changes. Some of the topics are general (for example, how to meet the needs of special education students), while others are more specific (such as, techniques and strategies for communicating with parents). At each meeting all participants receive a three-ring notebook at each meeting filled with useful handouts, reference sheets, and copy-ready information. Teachers sign in to document their presence, and at the end of the year earn one staff development unit toward certification require-

ments and a $150 stipend. Veteran teachers, department heads, and school officials present useful relevant topics. The new teachers keep coming back, however, for the unique opportunity to converse with peers. New teachers lack the chance to interact with others. Interactions with peers, self-reflection, and conversations are essential tools for teachers. Some days it is enough to hear that another teacher also struggles with making a positive impression on the first day (see "Starting with H_2O") or getting students to turn in their homework on time. Without such input from others, teachers can begin to feel isolated and alone.

Does this plan work?

As a new science teacher, there are unique concerns and questions specific to science teaching: "How will I ensure that my students are really internalizing the concepts and processes?" "How do I get all the supplies I need?" and "How do I maintain a safe and engaging environment for all of my students?" The large scope of the teacher induction program does not necessarily provide answers to these specific questions, but teachers can take information from the meetings and apply it to special situations and needs. For example, my classroom tends to have many student-centered activities and open-ended investigations, so I listened carefully for tips and suggestions during the "classroom management" session. None of the information from the meetings focuses directly on teaching science or a solution to every problem, but instead provides necessary resources to improve situations.

Additional help

In our county first-year teachers also are assigned a mentor. These mentors are tremendously helpful at times. Honest and open conversations with my mentor about both my successes and failures helped me reflect upon my teaching practices. Regular interactions with my mentor also ensured that I was aware of duties and responsibilities. Perhaps most importantly, my mentor was a motivator who encouraged me daily and constantly reminded me why I was a teacher.

Another technique aimed at improving teacher interactions is the adoption of "shared" planning periods. Our county will soon change from block scheduling to a seven-period day—we will teach five periods, one period is allotted for independent planning, and one period is allotted for shared planning. Time is allocated to meet with other teachers of the same grade level in different disciplines to coordinate efforts to educate the students effectively and comprehensively. For example, one share group may consist of a ninth-grade literature teacher, math teacher, English teacher, science teacher, and vocational teacher. The group meets daily to integrate lessons and share techniques. One day a week is devoted to technology integration, and the focus is always on teachers working together as teams. This change gives first-year teachers another opportunity to collaborate with their colleagues.

Professional development opportunities

Aside from the teacher induction program, mentors, and adoption of shared planning periods, my county also has provided the professional leave time necessary to attend annual conferences sponsored by our state science teachers association. The focus at the meetings is not just on new teacher concerns but also on science education issues. Teachers also have the opportunity to present ideas and teaching techniques to other educators. The exchange of ideas and knowledge keeps science education dynamic at the national, state, system, and school levels. Systems that want to keep good teachers on board and informed must offer opportunities to attend professional conferences and workshops.

MIKE OLLIVER

I am thankful that my system offers these valuable tools that have given me, and countless others, an excellent career start. And the county's efforts must be working. Preliminary information compiled by my principal suggests that the turnover rate for the 2002–2003 school year will be only 10%, down from the nearly 30% turnover for the 2001–2002 school year. We're hoping that things continue to improve with the help of these programs!

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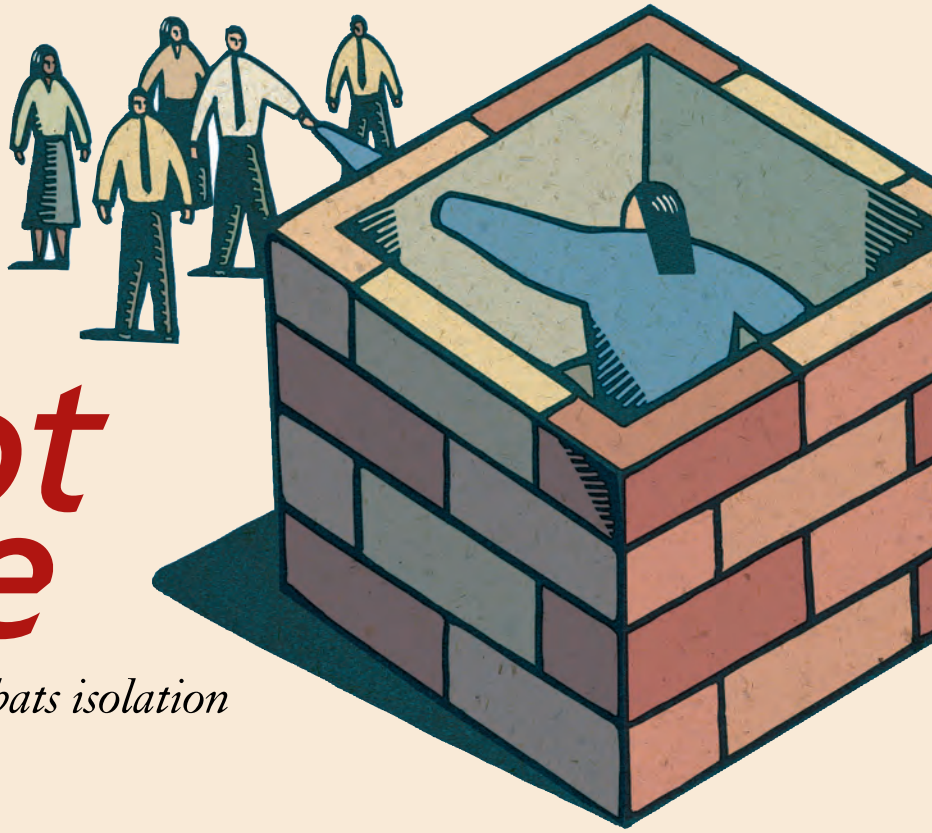
You Are *Not Alone*

First-year teacher combats isolation



Lucia Falsetti Guarino and Shayne Marie Watterson

Everyone needs a helping hand now and then. During the 2001–2002 academic year, I facilitated an action research group aimed at improving instructional practice among science teachers. The group also turned into a network of support for everyone involved, especially Shayne, a first-year chemistry teacher. During the meetings, Shayne shared her feelings of inadequacy about her minimal, first-year teacher repertoire of instructional methods. She often made statements such as, "I feel like I'm using the same techniques over and over again, and the students are getting tired of the repetition"; "I like to use concept mapping, but I think I use it too frequently"; and "Cooperative learning is great, but I think I'm overusing it." Shayne repeatedly searched for more ideas, and veteran teachers in the group suggested many resources.

Even though the group responded to Shayne's requests for additional resources and ideas, she still seemed unsettled. Finally, during one meeting, it became clear that what Shayne was seeking had little to do with the size of her instructional repertoire or cooperative learning—she felt isolated in her career. From that point on, Shayne documented her feelings in a journal. Here we offer some of her journal entries, which directly address the feelings and needs of new teachers and ways to overcome isolation. Even though Shayne, like many new teachers, felt alone and wanted a way to connect with her peers, she maintained a strong sense of personal commitment throughout the first year of her new profession.

Feelings of isolation

Journal entry #1

Now I am all alone. I teach in my room alone, I plan at home alone, I execute plans alone, and I reflect alone. It is a much different world than the one I became accustomed to throughout college, student teaching, and my first semester of teaching. Of course there are people around. I'm not really completely alone, but I don't have the types of interactions I am used to. Because I am lacking those interactions, I am not being the teacher I could. I have materials from the teacher who preceded me, and I am grateful that she has shared so much, but it is not mine. I occasionally find a worksheet, lab, or demonstration of hers that meets my daily needs, but I do not have the support I need to make complete coherent units that work for me, reflect on the success of those units, and select aspects to focus on or alter for next time.

In addition to being thrust into a position where I feel isolated, there is also a tremendous amount of pressure to be successful. I want to be the best teacher I can be, and I work very hard to create a good environment for students. However, I only have so many ideas and can only do so much alone. I have read articles and searched the Internet for innovative ideas, but these methods are time consuming. The gain almost never makes up for the lost time (the most precious resource in my life right now).

I want access to better approaches to creating a good classroom. I yearn to try new techniques and strategies. I want someone to help me in the way my cooperating teacher, fellow student teachers, and science coordinator did. I really want a person to talk to, reflect with, and bounce ideas off of. I don't

want to be a nuisance; I want the communication and sharing to be mutual and beneficial to both parties. It is shocking to be so isolated; the lack of collaborative planning and reflection is thwarting my ability to reach my maximum potential.

The feelings that Shayne expresses are not unusual for new teachers. For those who experience it, however, isolation can be very difficult. Isolation, both physical and social, is not new to teaching (Lortie, 1975). The structure of the school building itself isolates teachers from one another (Harris, 1995). This, coupled with the invisible walls constructed by the culture of teaching, creates a setting that promotes privacy and isolation (Britzman, 1986). Additionally, there are tacit rules about what is suitable to talk about in the workplace. It is acceptable to talk about the weather and sports and to complain about the students or school itself, but it is unacceptable to talk about the craft of teaching (Lieberman and Miller, 1984). Given the above conditions, it is no wonder that new teachers feel isolated and uncomfortable sharing their questions and concerns regarding their classrooms in fear of revealing their self-perceived inadequacies (Rogers and Babinski, 1999).

The value of good conversation

What is it that makes conversation worthwhile? That's the question author Roland Barth asked hundreds of people. Respondents answered that good conversation entails taking the time to talk together, allowing time to reflect on what is important, and listening without being judgmental. Worthwhile conversation, they said, strengthens relationships and mutual commitment (Barth, 2001).

As a new teacher with limited time and a sense of isolation, Shayne made the intuitive decision to join our action research group and became part of a powerful conversation.

Journal entry #2

In efforts to be part of a learning community, I have extended myself to many professional development opportunities. I am currently participating in a workshop with four other science teachers in my district. We have all found a focus within our classrooms that inspires us to do research and modify our strategies. This group is a tremendous support network. We meet every three to four weeks, discuss the focus issues, and support each other in a professional way. It is through the work of this group that I have gained the inspiration to share my ideas.

Shayne was proactive in searching for the conversations she needed to rescue her from isolation. Her success derives from the confidence she has in herself.

Taking responsibility

As a professor in an initial math and science certification program, I frequently hear students comment on external barriers that can block their own teaching. Why do these students focus on barriers when there is so much to learn about success? Even as a new science teacher many years ago, I did not consider those barriers, because I believed I had the power to influence student learning. Shayne offers sage advice to new teachers and, in doing so, shows that she, too, believes in taking responsibility for success.

Journal entry #3

A new teacher must take responsibility for what is going on in the classroom. It is easy to get swept up by others who say, "It's not your fault—if this school had a strong mentoring program, if you had your own classroom, if you had computers in your room, and if you only had one prep you would be a success." Many of these arguments seem to make sense and it is always easier to blame others than to take responsibility. New teachers must be empowered and responsible for their classroom, for the good and the bad. They must make things happen—seek out other teachers who are inspiring, attend workshops, and participate in professional development. The more positive interactions a new science educator has with colleagues, the more empowered that teacher becomes. A teacher shouldn't be unsuccessful because of what others have not done; they should be successful because of what they have done.

Keep the door open

From time to time I hear teachers say that one of the great things about teaching is being able to go into a room, shut the door, and do anything! While this may be true to some extent, we urge new teachers to keep their doors open. Autonomy does not grow out of isolation. Finding the right conversations and becoming part of them will serve science teachers well in the years to come. We hope that by sharing Shayne's proactive approach to overcoming her isolation, other new teachers will feel empowered to do the same. ~

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Mark Your Calendar!

Seasonal checklist for surviving the first year

Pamela Petzel Snyder and Sandra A. Stroot

First-year teachers with limited experience sometimes have difficulty managing the vast number of tasks presented throughout the school year. To help new teachers prioritize their responsibilities, a mentor teacher within the Columbus Public School District in Columbus, Ohio, developed a "New Science Teacher Checklist" (Figure 1). The list was designed for participants of Columbus's Peer Assistance and Review (PAR), a program that provides support for teachers new to the district. The month-by-month checklist helps new science teachers anticipate upcoming events, such as science fairs and field trips, and plan accordingly. Here we expand upon the checklist and address specific challenges faced by new science teachers.

August (before school starts)

Before the year starts, beginning science teachers can visit their building; locate their room (or rooms, if they will be traveling); find teacher and student resources, such as textbooks and lab supplies; and meet with other staff members. This is the perfect opportunity for new teachers to introduce themselves to administrators, secretaries, custodians, counselors, and other teachers, especially science teachers. The beginning of the year also is a good time for novice teachers to identify routines and procedures for disciplining, managing lab activities, organizing papers, and communicating ideas. Many teachers create bulletin boards or posters to describe organizational procedures used throughout the year.

Teachers should develop an orientation letter that introduces them and explains their expectations to students and their parents or guardians, and a safety contract that requires signatures of parent(s) or guardian(s). This is also a good time for teachers to ask their school office about the policy on field trip permission slips.

Science teachers typically have to manage more equipment and supplies than other teachers. Many develop a numbering system and organize lab materials into "kits." Plastic sealable sandwich bags, shoeboxes, cardboard pop trays, and a variety of plastic tubs make great organizational tools. If new science teachers send home with students a "wish list" of needed supplies, they may be pleasantly surprised with the response. Teachers should again check with the front office to determine school policies for charging lab fees and purchasing equipment and supplies.

Before the school year begins, first-year teachers can develop an overall course outline for at least the first grading period and ideally the first semester. Detailed daily lesson plans for the first week of school should include icebreaker activities and introductions (including the new teacher!).

September–October (first weeks of school)

Beginning science teachers need to connect with students and at the same time plan and implement creative, high-involvement lessons during the first few hectic weeks. Many teachers in the Columbus Public Schools have a saying that "students don't care what you know until they know how much you care." An infinite number of teaching styles and strategies can be used to develop positive relationships with students. For guidance, new teachers can reflect on their own favorite teachers or teachers they have met during student teaching. Humor (not sarcasm) is a great way to start, as are handshakes and "high fives." Extra teaching duties provide opportunities to talk with students while monitoring halls, lunchrooms, or buses. Many science teachers ask students to complete journaling activities or questionnaires to understand their likes, dislikes, or hobbies. Teachers new to a building can become better acquainted with students by attending sporting or musical events.

Popular but poor advice given to new teachers is, "Don't smile before Christmas." Smiling a lot is important, long before Christmas! The best science teachers have high standards and expectations for student achievement, yet let students know they care about them personally and are interested in their unique individual development. There is no substitute for developing positive, professional relationships with students in all classes.

FIGURE 1

New science teacher checklist.

For an organized, productive, and successful year, science teachers should:

August

- ✔ Go to their building, find their room(s), meet staff, and locate resources
- ✔ Think through and design organizational strategies
- ✔ Design a "wish list" of supplies and an orientation letter or brochure to send home with students the first day (include a safety contract and field trip permission slip)
- ✔ Plan first semester (in general) and first weeks (detailed)

September–October

- ✔ Create positive relationships with students
- ✔ Plan and implement high-involvement lessons
- ✔ Communicate expectations to students
- ✔ Teach and reinforce safety procedures
- ✔ Communicate with parents
- ✔ Stay current with record keeping

November–December

- ✔ Plan lessons that maintain student interest during holiday disruptions
- ✔ "Plan backward" from science fair dates
- ✔ Reflect and plan for remainder of semester
- ✔ Rest

January–March

- ✔ Network with colleagues
- ✔ Focus on individual students
- ✔ Complete long-term planning for remainder of year
- ✔ Self-evaluate and reflect on teaching performance
- ✔ Implement new strategies
- ✔ Check on certification or licensure status

April–June

- ✔ Plan active, motivating lessons to combat spring fever
- ✔ Begin to plan and order supplies for next year
- ✔ Network with colleagues
- ✔ Evaluate overall student performance
- ✔ Evaluate, reflect, and pursue professional development

Involving students in daily lessons is essential. Most science teachers understand the importance of lab activities; however, they need to keep the lecture or fact-giving portion of lessons interactive. Changes of pace should be integrated approximately every 20 minutes. Going from one worksheet to another is not a change of pace! Integrating technology, small-group activities, graphic organizers, student projects, presentations, and authentic assessments are important. Time-on-task is crucial for teacher and student success. Teachers can access professional journals and the Internet for relevant and interesting activities.

Setting the tone for classroom expectations is imperative. Novice teachers must take time to teach students how to behave and follow routines, procedures, and organizational strategies. Baby steps are easier in the beginning. Time spent on management, behavior, and discipline will pay off later. If students are not focused on the lessons, the content presented will not matter. Teachers must remember, however, that planning can have a major impact on student conduct. Planning enough well-organized, structured activities will minimize many student management issues.

Novice teachers must take time to teach students how to behave and follow routines, procedures, and organizational strategies.

When planning lessons, science instructors must always remember to include safety rules, which should be posted and reviewed before each activity. Students can make posters or create skits to illustrate specific safety measures. If a safety test is given, students should correct their wrong answers. The instructor should then make a copy of the corrected test, file the original, and give copies back to students for their notebooks. The teacher is responsible for making sure absent students get the information. All teachers should revisit safety expectations before every lab activity. Science teachers need to positively *reinforce* students who follow safety rules and *correct* students who make mistakes. It is not enough to just tell students to wear eye protection. If instructors see students without goggles or wearing them on top of their heads, they *must* intervene. Allowing food and beverages in a science room where chemicals are used is not appropriate. Interventions can range from a simple verbal reminder to points deducted from the lab grade. If an accident happens, teachers can be found liable if they knew that safety infractions occurred and did not correct them. Teachers should remember that students are inexperienced and may need reminders to heed basic safety precautions, such as tying hair back, wearing closed-toed shoes, or removing contact lenses.

It also is imperative that teachers never leave a class unattended. This expectation is even more crucial for science teachers, who may have dangerous equipment and supplies in their classrooms. New teachers should review their districts' safety recommendations.

The early part of the year is a good time for new teachers to begin positive contacts with parents or guardians and to keep a log of contacts with brief notes about discussion topics. Even though this is time-consuming, teachers should make every effort to stay current with grading, attendance, and other forms of record keeping. It soon will be time to issue grade reports.

Entry-year teachers need to take time for themselves, otherwise their professional and personal lives may suffer. They need to learn to say "no" or "maybe next year." It is imperative for novice teachers to realize that their first professional obligation is to the students in their classrooms.

November–December

As the holidays approach, teachers will again need to think about planning. Allowing "free days" on the last days before a holiday is a recipe for disaster. There are many educational, fun activities that seem like breaks but provide opportunities for student learning at the same time.

To prepare for a spring science fair, new teachers will have to "plan backward" in order to give students adequate time to complete quality projects. Entry-year teachers should work with veteran staff because science fairs are big responsibilities to tackle alone.

The winter break is a great time for novice teachers to "take a deep breath" and prepare for the remainder of the year. Teachers should take another look at their long-term lesson planning and complete plans for at least the rest of the semester, if not the remainder of the school year.

January–March

Early winter is a great time for entry-year teachers to network with other teachers in their building or district. They may decide to team with someone to create a cross-curricular unit. Math and science are natural examples. Math teachers can help students complete numerical and graphical analyses of data from a science lab. If science classes are completing a water-quality study, perhaps language arts teachers can select literature that contains river, stream, or pollution references. Social studies teachers can connect waterways to historical and economic development of an area. Science teachers can find colleagues who might be interested in developing more plans over the summer. They may decide to join an e-mail discussion group or a professional organization as a way of communicating with science professionals across the country.

Beginning science teachers may have progressed to a later stage of professional development at this point, where they are able to address the needs of individual students, rather than thinking of their classes as entire units. They can begin to target individual students with specific behavioral and instructional plans.

New teachers should review term planning, either modifying existing plans or completing the plan for the remainder of the school year. They should make sure that they are able to cover the expected content for the entire course.

Novice teachers must reflect and self-evaluate their teaching technique. Beginners often rely too much on lecture. This traditional technique seems easier to present and control, and it may have been the method used in their own preparation. As new teachers consider integrating more small-group and inquiry instruction, they should also begin to think about alternative assessments.

This time of year is also good for teachers to check the status of their certification or licensure. While completing this task, they can think about summer professional development activities.

April–June

Spring fever will impact new teachers and students. Teachers should organize dynamic, motivating activities to keep students attentive and focused on their learning outcomes.

New teachers can now begin to plan for next year. They can review their lesson plans and order required supplies. Entry-year teachers will have to work with other science teachers in their school to share ideas, strategies, and develop a coordinated effort to maximize the supplies and equipment that must be shared.

Finally, novice teachers can evaluate their long-term professional development plans. The summer provides many opportunities for professional enrichment or college credit opportunities. Many classes and workshops help teachers develop strategies to encourage students to develop more self-discipline and share the responsibility of classroom management. There may be opportunities for teachers to improve their skills in authentic assessment and develop more inquiry-based instruction. In addition, committee involvement will help new teachers learn more about their district, students, and staff.

Filled with excitement, trepidation, and possibilities, a teacher's first year in the profession is unlike any other. At the end of the year, new teachers deserve a pat on the back for their hard work and for succeeding, one month at a time!

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Preparing Preservice Teachers

Laying groundwork at the university level

Sarah Haines

Many studies have examined the high rate of teacher turnover in the United States and the news isn't good. In a typical year, an estimated six percent of the nation's teaching force leaves the profession (Ingersoll, 2000). Research collectively shows that the academic fields of mathematics, science, and special education have the highest turnover rates (Boe, Bobbitt, and Cook, 1997; Grissmer and Kirby, 1992; Murnane et al., 1991; Rumberger, 1987). Most leave classroom teaching due to low salary and lack of administrative support (Ingersoll, 2000).

The United States is definitely experiencing a teacher shortage and the best way to alleviate this problem is to focus on teacher retention, rather than teacher recruitment (Ingersoll, 2000). The rationale is that teacher recruitment only fills vacancies created by teachers who leave the profession within the first few years. Therefore, recruitment efforts do not ease the chronic shortage of teachers, but only replace those who leave the profession year after year. By concentrating efforts on teacher retention, many of these vacancies may disappear.

One way to improve teacher retention is to adequately prepare preservice teachers while they are enrolled in professional teacher education programs at colleges and universities. All too often, a student majoring in education doesn't begin student teaching until their final

semester in school. The student's first classroom teaching experience comes during that final semester, and the scenario is typically a shock. Students majoring in science disciplines engage in scientific activity in their introductory courses. Why are most preservice teachers only immersed in science teaching and the classroom atmosphere when they have nearly completed their degree?

In a model developed at Towson University, preservice science teachers gain valuable classroom teaching experience as early as the second semester. Within what is termed the professional development school (PDS) network, preservice and veteran teachers work in unison to strengthen science education at the secondary level and enhance teacher retention rates. This article outlines the fundamentals of the program.

Professional development schools

According to the National Education Association, "Professional development schools are partnerships between teacher education programs at universities and local public schools or districts. Their goal is not only to improve teacher education programs but also to restructure public schools, create opportunities for veteran teachers, and bolster education research by putting theories into work in real classrooms" (NEA, 2000). The network has six main goals:

- To create a collaborative culture and governance structure to guide the work of the network;
- To provide an enhanced preservice experience through the integration of theory and practice in a clinically based teacher education program;
- To provide needs-based, continuous professional development for inservice teachers and administrators;
- To provide for inquiry into and refinement of effective practices in teaching and learning;
- To maximize student achievement; and
- To disseminate promising practices and structures to the education community.

Science teaching practicums

Upon completion of basic university science coursework, students earning certification for middle and high school teaching (grades 7–12) choose a content major, then enter a four-semester professional education sequence. During the second semester of this sequence, students enroll in the following courses: Life Science, Earth and Space Science (both combine content and pedagogy), Teaching Mathematics, a science practicum, and a mathematics practicum.

The science teaching practicum requires preservice teachers to spend one afternoon a week teaching science in the classroom. Prior to the first day of teaching, they become acquainted with the classroom teacher and rules. Preservice teachers in groups of four teach content specified by the classroom teacher. Each preservice teacher is responsible for teaching the day's lesson to a small group of about five or six students.

In addition to instruction, responsibilities throughout the practicum include: creating bulletin boards, constructing and scoring writing assignments, administering a science attitude survey, and constructing, administering, and scoring a performance-based summative assessment. Preservice teachers typically spend two to three hours at the school each week: 30 minutes of preparation; one hour to 90 minutes of teaching; 30 minutes of "debriefing" by the university professor and the classroom teacher; and 30 minutes of planning for the following week's lesson (Figure 1). For an example of a student-directed activity, see "Analyzing soil samples,"next page.

The semester following the completion of practicum and content courses, preservice teachers enter a PDS program and enroll in an additional science teaching practicum where they engage students in discovery and inquiry activities covering topics such as microbiology,

FIGURE 1

Instructional sequence for university students enrolled in science teaching.

Pre-classroom activities (30–40 minutes):

- Prep materials and review group plans for lesson
- Work with group and university instructor on strategies for future lessons

Classroom activities (70–90 minutes):

- Get settled with group of students
- Lesson introduction by one university student
- Whole-class focus on tasks ahead; review
- Lesson in small subgroup
- Clean up: reorganize equipment and materials
- Group discussion
- Writing activities and notebook upkeep
- Whole-class conclusion by university student

* Sequence of classroom activities is determined by the group of university students for each lesson

Post-classroom activities (30 minutes):

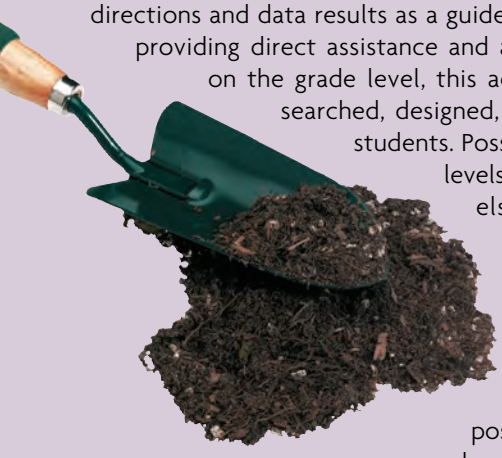
- Team debriefing on lesson with university instructor (instructor will be rotating during lesson)
- Whole-group issues focus by university instructor
- Planning time for future lessons

Analyzing soil samples

One day, as part of the practicum experience, undergraduates engaged middle school students in an inquiry activity to analyze soil samples collected on the school site. The data collected was used to determine if the soil could support a butterfly garden, or if the soil would need amending before the butterfly garden could be established.

University students arrived at the school 30–60 minutes before they began teaching. A meeting space was designated where practicum students could finalize plans for the day's lesson, ask the instructor any questions, set up materials, and copy papers. Once students reported to their classrooms, an undergrad led students in an introductory set or anticipatory activity, linking the material covered the previous week with the new material. Following the motivational activity, undergrads joined student subgroups at their respective worksites with the following materials: large pieces of chart paper, distilled water, a measuring cup, two quart-size resealable plastic bags, soil texture data sheets, a 2 L soda bottle, pH paper, coffee filters, and soil testing kits.

With the exception of the introduction and conclusion of the lesson, this activity was completely student-directed. Students chose which tests provide them with the information needed to make an informed decision about the soil sample, completed activities as a group, and attempted to answer their own questions using only test directions and data results as a guide. The undergrads refrained from providing direct assistance and acted as facilitators. Depending on the grade level, this activity might be completely researched, designed, established, and maintained by students. Possible tests included soil type, pH levels, nitrogen levels, phosphorus levels, and potassium levels. Some questions students raised were: "How could we make a poor soil sample more suitable for plant growing?" "What pH level is best—are we looking for a high pH or a low pH?" and "Is it possible to add nitrogen, potassium, or phosphorus to soil? How?"



Finally, another undergrad led a class discussion. Students shared results and offered reasons for discrepancies between groups. Students analyzed data gathered by the class to determine if soil was ready for planting. If the students resolved that the soil would support a butterfly garden in its present state, they were required to explain what further amendments were necessary to make the soil more suitable for growing plants. Experimentation, collaboration, and sharing of ideas were encouraged throughout the series of lessons. After class, undergraduates received feedback from both the classroom teacher and the university instructor.

genetics, taxonomic classification, heat transfer, friction, and levels of ecological organization. This program emphasizes the constructivist-learning model and therefore activities tend to be student-centered rather than teacher-centered.

Students entering the third semester of the professional sequence participate in classes on site at the PDS (Figure 2). Preservice teachers participate in all school-based activities, such as PTA meetings and professional development activities. Students apply their pedagogical knowledge to actual classroom teaching situations at all PDS locations.

Finally, students entering the fourth and last semester of the professional sequence participate in a student-teaching internship at the schools where they already have been teaching and learning for one or two semesters. At the conclusion of the professional sequence, students have been part of the school community for several semesters.

Assessing the program

In addition to normal course assessments (Figure 3), students enrolled in the science practicum complete team reflections. In these reflections, students must evaluate their performance in the classroom as a team: How effective was their teaching? What did they like about working together in the same classroom? What would they change? What aspects of the experience did they especially enjoy? During the final exam, each team completes a written and verbal reflection of the experience. Students also complete a self-evaluation of their effort. Three times during the semester, classroom teachers complete teaching evaluation forms for undergraduates teaching in their classroom and provide the university instructor and students with informal verbal feedback. Most classroom teachers and students enjoy having university students come into the classroom. It is not uncommon to receive requests for them to return for another semester. The university students also complete customary course evaluations at the end of the semester. On a scale of 1 through 5, students over the past three semesters have rated the overall course experience as a 4.73.

A few of the comments on the course evaluations include: "I liked being in the classroom and having other university students there for support. I also liked teaching the small groups because I got to know my students well"; "Early field experience was helpful"; "I learned more about science and teaching this semester than I have in any other course"; and "Applying the teaching knowledge we gained in our regular classes definitely helped me see how everything ties together."

Students enrolled in the professional development school sequence have their classroom teaching evaluated by both the classroom teacher and the university supervisor with formal course evaluations. The professional development schools are evaluated according to standards

FIGURE 2

Professional education program courses taught on-site at professional development schools: secondary grades.

Teaching science in the secondary school:

Selection of appropriate content, methods, and evaluation techniques. Analysis of textbooks and resource materials for teaching science in the middle and high schools.

Field experiences in secondary education:

Experiences in observing and studying school activities directly related to classroom instruction and pupil learning: observing and analyzing teacher roles, student roles, and instructional environment. Emphasis is placed on direct experience in a variety of settings.

Using reading and writing in the secondary schools:

Examination of and practice using a range of assessments for reading and language arts development, focusing on the relationship of assessment to instructional planning for diverse learners.

Internship in secondary education:

Clinical experience in a professional development school during the semester immediately prior to student teaching; focus on classroom management and discipline technology utilization and reflective practices.

FIGURE 3

Assignments required by science practicum students.

Team tasks:

- Writing activity constructed and given to entire class
- Bulletin board
- Unit assessment—performance based
- Team reflection in written form

Individual tasks:

- Writing activity constructed and given to subgroup
- Folder monitoring of subgroup students
- Affective checklist constructed and given to subgroup
- Learning center constructed and utilized as unit review
- Weekly journal entries sent to university instructor
- Final exam
- At least one introduction and conclusion conducted

set by the Maryland Professional Development School Consortium and the National Council for Accreditation of Teacher Education. A committee of university professors, classroom teachers, school administrators, and external members of the community who are not directly involved with the PDS conduct the evaluation.

Benefits

Less than half of all teachers hired in the last nine years participated in any sort of formal induction program during the first teaching year (Ingersoll, 2000). Providing preservice teachers with experience inside school walls and support from university faculty members is invaluable. Novices entering other professions often work under more experienced members of the field—physicians, engineers, and architects—why should teaching be any different? If preservice teachers have the support system they need to succeed and continuous exposure to teaching in local schools throughout the professional sequence of study, we can ease teacher retention problems. We are taught that children should "do science as scientists do." Why shouldn't preservice teachers be teaching science as inservice teachers do? When teacher education is based on experiences with children and ideas can be tested in actual classrooms, everyone benefits. ~

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Everyone Needs a *Mentor*

Guiding first-year teachers toward success

Michael Lach and Douglas Goodwin

Mentoring is a complex role that encompasses criticism and praise, pressure and nurturing, logistics, organization, and persistence. While many school districts have specific procedures and objectives for mentoring, the common focus is to provide the best possible experience for first-year teachers. This article offers ways in which mentors can ensure the success of new teachers for years to come.

As mentors, we need to acknowledge the perspectives and mindset of new teachers. In all likelihood, they just completed their education credentials, have tremendous enthusiasm for kids, and are in tune with the latest science content and education pedagogy. New teachers probably haven't written many lesson plans, given many tests, or led many discussions. They aren't familiar with lab equipment and how to use it safely with a group of teenagers. More importantly, they don't have the repertoire of tricks or confidence that comes with years of experience.

However, new science educators offer a fresh perspective on teaching and learning and an enthusiasm untarnished by bureaucracies, difficult students, and parents. Strong science departments and schools provide new teachers with enough support to stand comfortably on their own without zapping the energy that can revitalize a school system. The more we veteran teachers capitalize on the innovations of our new peers, the better we all will perform.

Before school starts

Mentors should get in touch with new science teachers before the first day of school to fill them in on district and school policies, first-day strategies, classroom structures, and any shared school laboratories or facilities. Mentors can assist new teachers with creating a syllabus, writing a welcome letter to parents, and developing a grading policy that meshes with the district and science department.

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Classroom management is often a challenge for new teachers. Before the first day, new teachers must familiarize themselves with the school's discipline practices—procedures for tardiness, detentions and suspensions, and protocols for including parents when resolving classroom issues. Mentors should emphasize that many classroom discipline problems are avoided by having organized classroom operating systems, such as managing laboratory materials, distributing and collecting papers, recording tardy students, and conducting group work. If new teachers thoroughly review discipline policies before school starts, they can concentrate more on science content and process when students arrive.

Setting goals at the beginning of the school year allows new teachers to reflect on their progress as they revisit and revise their strategies throughout the course. Having a clear set of goals on paper is particularly useful because it helps focus energy on important objectives for science students and classrooms.

An open classroom

Once school begins, new teachers need to observe classrooms taught by veteran teachers. Mentors should invite new teachers into their classrooms and provide objectives for the class and how they will be accomplished. Mentors also can highlight verbal cues used by teachers to keep students focused, or small comments and glances used to build rapport and community within a group. The observing teacher can write down questions that arise. The rationale behind observed actions can be discussed after class. In subsequent observations, new teachers should focus on particular aspects of teaching: how to manage material resources, target activities to multiple ability levels among students, and instruct students to take notes during a class discussion.

Mentors also should observe new teacher classrooms. Peer advice and assistance are valuable development tools for new teachers learning the ropes. New teachers may also benefit from team-taught or team-planned lessons and units.

In schools where materials aren't plentiful, veterans should be generous with lab equipment and office supplies. The department should share resources acquired over the years and include new educators on special orders or deals.

School and district

Processes and procedures can be overwhelming to someone inexperienced and just out of school. Mentors help ease some of the burden by showing new teachers how to complete progress reports, order materials, reserve space in computer labs, set up field trips, and obtain resources from the library or media center. Mentors also should

explain how to record attendance and tardies and ways to track phone calls to parents. New teachers should be introduced to the district's science coordinator and made aware of special events, such as districtwide professional development opportunities. Local e-mail lists are crucial for contacts and the chance to converse about science education with other professionals. Opening the school and district to new teachers provides much-needed resources and the comfort of knowing additional help and information is nearby. Introducing new teachers to the benefits of professional education organizations may help them identify potential contact sources when they need help with lesson plans or new trends.

Community connection

Even if new teachers grew up in the same neighborhood where they teach, they probably haven't looked at it from a scientific perspective. By encouraging new teachers to attend local museums, geological and environmental exhibits, and scientific group meetings in the region, mentors show them that every community has some sort of scientific presence. New teachers also should be encouraged to attend local school government or parent meetings.

A vision

New teachers need concrete examples of excellent practices. If there is a renowned teacher in the school, for instance, a teacher-of-the-year or one certified by the National Board for Professional Teaching Standards, new science teachers should observe the master in action. The school administration can support such observations by providing release time and class coverage. The aspects of quality teaching unique to science include laboratory activities with diverse groups of students and scientific inquiry. The more observations made of good teaching, the more background new teachers will have in their arsenal and the sharper their focus will be on their future growth.

Social importance

Given how isolating the teaching profession can be, mentors should reach out to new teachers on a social and personal level. Sitting by them in department and staff meetings, inviting them to the teachers' lounge for lunch or a break, and joining them at conventions or conferences can make a difference. Mentors should inform new teachers of opportunities to get involved with the school, such as chaperoning dances, attending athletic events, and organizing field trips with other classes.

Easing in

In many schools, classes are apportioned so new teachers receive the most difficult assignments—classes with large numbers of students, younger students, lower-ability students, or more special education students. Because the first year is so challenging, the most inexperienced faculty members should be assigned to the least difficult classes. This allows the new teacher to ease into the career of teaching by minimizing frustration to ensure a positive attitude about science, students, and the teaching and learning process. Mentors need to advocate the needs of new teachers to department heads and administration—their success will bring success to everyone.

Focus on implementation

For new teachers, classroom management and lesson planning are activities of immediate concern. Many new teachers have difficulty seeing the connection between a well-behaved class and well-planned instructional activities. Standards-based curricula, such as those produced with support from the National Science Foundation, provide well-written lessons with student materials and equipment kits, allowing new teachers to focus more on implementation and less on curriculum design. They provide the research base and have documented effectiveness that offers a safety net to a novice teacher's first year. New teachers can focus attention on classroom management, interactions with students, and relationships with parents. For those who want to flex their creative muscles, there are plenty of additional resources, ideas, and activities that can be implemented to supplement what's already been developed.

Most teacher preparation programs will instruct new teachers in the appropriate use of state and national science standards (NRC, 1996), yet connecting these to practice is difficult. In conversations with new teachers, it is helpful to concentrate on standards that describe student knowledge and capabilities, particularly when goal setting. This ensures that the focus remains on the academic achievement of students.

The science teacher's first year doesn't have to be a difficult and trying experience. While many factors can influence the effectiveness of a first-year teacher, strong and meaningful support from colleagues can make the difference between a young amateur and a savvy practitioner. By working together, we can make new science educators in our schools more effective and that helps all of us.

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Practice Makes Perfect

New science teachers face a daunting task. They must rapidly learn how to put together notes, find interesting demos, present challenging labs, provide appropriate homework, write tests and quizzes, stay organized, and find a balance between home and school.

My colleague and I have 35 years of teaching experience combined. When we were asked two years ago to share a classroom and chemistry lab, we sat down and outlined what has worked and what hasn't worked for us during our careers. Taking these notes into consideration, we developed a plan for the scholastic year that has proven successful in a very competitive, academic school. We hope our tips will help new teachers survive (and thrive) during their first year.

First-day demonstrations

We begin the academic year with demonstrations on the first day. Presenting concepts gives students a captivating preview of what's to come. To demonstrate conductivity, we place electrodes attached to a light bulb into aqueous solutions of acids, bases, salts, and molecular compounds. The strength of conductivity depends on the degree of ionization (amount of charged particles) in a solution. The stronger the conductor, the brighter the bulb glows. To introduce gas laws, we put a small piece of dry ice in a bottle filled with water. The dry ice creates pressure, forcing a stream of water to shoot out of the bottle without squeezing the bottle.

After engaging students with demos, we outline safety rules and the layout of the lab room. Each numbered lab station is equipped with individual lab drawers and a common equipment cabinet containing laminated equipment lists. Posted on each bench are lab duties: opening and locking lab drawers, cleaning sinks, wiping down reagent areas, straightening aprons, and turning on the UV light in the goggle cabinet. Each lab bench takes care of one responsibility to ensure the next class has all the materials neatly organized.

The first lab day begins with a song, "The Twelve Days of Chemistry," similar to the one found in *Idea Bank Collation: A Handbook for Science Teachers* (Talesnick, 1984). Sung to the tune of *The Twelve Days of Christmas*, the words are as follows: "On the first day of chemistry my teacher gave to me a test tube and an Erlenmeyer flask." For the second through twelfth days, we add the words "two forceps, three beakers, four glass plates, five ring stands, six Florence flasks, seven watch glasses, eight tongs a carrying, nine covered crucibles, ten graduated cylinders, eleven pipettes dripping, and twelve strikers striking," respectively. By the end of the song, most students are familiar with the name and sight of equipment. Students then proceed to their stocked lab drawers to check, clean, and replace items.

Enforcing safety

Following the lab check, we administer a lab safety test. The safety test consists of 30 multiple-choice questions regarding: wafting, appropriate clothing in lab, the proper method for inserting glass tubing into a rubber stopper, careful handling of reagents, how to heat alcohols and hydrocarbons, correct heating of test tubes with chemicals, specific types of glassware that can be heated, how to clean up chemical spills, first aid for cuts and chemical burns, how to neutralize substances, using hood for poisonous gases, how to light burners, and proper order for diluting acids. In addition, the students must identify 10 pieces of standard laboratory equipment and score a 90 percent on this test to continue. The test is retaken until passed.

Consistency is key

Most students, especially those with learning difficulties, perform best with a consistent schedule. We provide students with notes for the entire course at the beginning of the school year, which are written and copied during the summer. Notes are color coded: white for teacher notes, peach for labs, and yellow for homework. Included in the notes is a schedule of when labs, assignments, or tests will occur. Although flexibility is sometimes needed, students typically stick to a schedule: *For example:*

- Tuesdays are lab days (appropriate dress and shoes for lab);
- Homework is due on Thursdays;
- Fridays are typically test or quiz days.

Our grading system is broken down to include homework (15 percent), lab work (20 percent), quizzes and review quizzes (15 percent), and tests (50 percent). Students receive full, partial, or no credit for their work and have a one-day extension

certificate that may be used for any late work.

Mastering the material

Guided practice problems are worked out on the board by students to assess who understands the material. We divide quizzes into new and review material quizzes. Retests and requizzes are available to ensure that students master the material. Each retest and requiz consists of essays, short-answer questions, or problem sets (no multiple choice). The varied format makes students think more because there are no visual cues to aid their progress and they are forced to understand the material better the second time around. Students are given the better grade of the two; most score higher on the retake.

Labs are a crucial part of chemistry. Appropriate safety apparel is required. Students are asked to keep an old pair of tennis shoes in their locker and are constantly reminded to keep their goggles on. Lab partners are assigned and rotated each month. After the first rotation, students are then paired appropriately based on strengths and weaknesses.

By spring, the most challenging material has yet to materialize; however, students usually are restless by this point. To maintain their attention, mole bucks—small dollar bills with mole faces in the center—are used for extra credit on tests. To earn a mole buck, students must answer several questions correctly. The bucks may be used for one free test question and no more than one may be used per test. Students pay apt attention and often inquire about the number of bucks they've accumulated.

We do not give extra credit readily, but provide one project each semester that allows students up to 50 points on their lowest test (not to exceed 100 points). One way to gain extra credit points is to dress up like a mole on "Mole Day," October 23, to celebrate the standard unit of measurement and to correspond with 6.02×10^{23}.

The first semester we provide costume ideas and patterns for moles. This past year, one student came in dressed as the "Last of the Molehicans," wrapped in a blanket with a headband. One student dressed in all white as a "dental molar." For extra credit the second semester we ask students to create a chemistry magazine complete with articles, how-tos, jokes, recipes in metric units, and interviews. Students can work with a peer or individually and are limited only by their imagination and creativity.

We hope these classroom suggestions, garnered by us through the years, will help new teachers. Most importantly, however, we want new teachers to enjoy the ride! Teaching is incredibly rewarding and exciting—we speak from experience!

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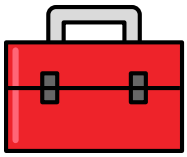

The New Teacher's Toolbox

September 2010, Tips and Strategies for Teachers Just Starting Out

Michael Romano

Introducing The New Teacher's Toolbox!

The first years of teaching can be tough: Getting to know a new school, new students, and what *really* works in the classroom can be a lot to handle! In this new column, Michael Romano will share some insight from his first years of teaching—and some tips to help new (and even veteran) teachers along the way.

Conquering the "So What Now?" Moment

I can remember it well. The bell had just rung, and 26 students were sitting in their desks. It was my first period class on the first day of school, and I was fresh out of graduate school with a brain full of ideas about how this class would go. But with 26 pairs of eyes staring at me, all of the theory seemed useless. *So what now?* I thought.

Any veteran teacher can recount that moment on their first day of school. The best piece of advice a colleague gave me that morning was to embrace the anxiety and anticipation and savor the day. The first day of school is always a blur with so many tasks to accomplish—discussing expectations, distributing books, learning names, introducing course materials—and there is always the concern that you will rush through too quickly or talk too much and run out of time. There are a number of tips I picked up from other teachers that helped me get through that day; these ideas certainly made my first day—and every first day since—smoother.

With 26 pairs of eyes staring at me, all of the theory seemed useless. **So what now?** *I thought.*

Own it. Cliches are so trite, but it is true that you never get a second chance to make a first impression. Walk into that first class relaxed but energized, and with an attitude that you own the place, but without pretension. If you demonstrate confidence, your students will see it and respect it.

Preparation, preparation, preparation. As with all lessons, preparation is the key to success. Create your seating charts in advance; alphabetical charts are perfect for day one. Lay the textbooks out in a convenient spot so you are not reaching and huffing in front of the class.

Get all the information. I like to have a "Student Info Sheet" on the desks as students arrive so they can begin working immediately. This gives you an opportunity to uncover some important information and keep students engaged while you distribute books and answer questions. I ask about parent contact information, nicknames, potential allergies, a favorite lab or activity from last year's science class, and activities and interests outside of school. This helps paint a more complete picture of each student and can be invaluable information when establishing rapport in the crucial first weeks of class.

Learn names. Make it your task to learn all of your students' names by the end of the first week. This is no easy feat, but it makes all the difference in establishing rapport. Take attendance and repeat each name as you go. Go down the rows in your head while students are working. If your attendance or grading program creates seating charts with pictures, print them out and take them home to study. If you make a mistake or cannot remember a name, just smile and say, "Oh man, I'm trying so hard!"

End with a bang. The first day involves a lot of bookkeeping, but it also marks your first chance to set the tone for learning. In my biology classes, I like to start with a *National Geographic News* article about a snake with two heads (Mayell 2002). I ask my students to consider whether having two heads puts this snake at an advantage over other snakes. An engaging discussion about the nature of science and questioning the natural world ensues, and if the timing works perfectly, I leave them hanging about some answers until the second day!

In my chemistry classes, I do some color change demonstrations that draw out the process of scientific inquiry and relate chemistry to everyday occurrences. Activities like these are open-ended enough to relate to multiple course topics and engaging enough to hold interest on a day that will likely be fairly monotonous in other classes. Instead, by establishing a plan for success, you can turn the first day of school from one of apprehension and anxiety to one of anticipation.

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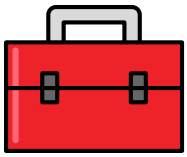

The New Teacher's Toolbox

October 2010, Tips and Strategies for Teachers Just Starting Out

Michael Romano

Teaching in the Digital Age

I went to school in the overhead projector age, and I was a senior in high school the first time one of my teachers used a PowerPoint presentation in class. I remember him using flashy transitions to make the words move on the screen, but it kept our attention the way no transparency ever could. I also remember some teachers scoffing at this new medium that they knew relatively little about. More traditional ways of teaching were still in favor, and there was no guarantee that student learning would be measurably affected by this technology, or so they argued.

By the time college rolled around, all of my professors were using PowerPoint. We turned in biology lab reports through a website, completed weekly chemistry problems online, and even used Dreamweaver to develop websites in an educational technology course. My friends were all using this new social networking site called *Facebook,* and by graduation, the full force of this technological revolution had become apparent.

As scientists, we are keenly aware of technology's effect on discovery—imagine our field without digital microscopy, satellites, or the internet. As more of our world conforms to this digital age, education faces a similar renaissance. New technologies are engaging today's students the way PowerPoint did a decade ago. The pressure to go digital can seem especially overwhelming to new teachers, but fear not! Teaching in the digital age is easier than you think. Here are some tips to help get you started.

Start a course website. A course website is a great place to compile resources that your students can use every day, and it doesn't take much time to create one. I keep mine up-to-date with a current unit schedule so students can see what they have missed when absent and parents can see what we are working on in class. For my chemistry classes, I post solved homework problems as PDFs so students can check their own answers. This allows them to follow along with my work if they are struggling at home and saves valuable class time, as I am able to focus on trouble spots instead of reviewing every problem. I also post links to helpful websites—interactive periodic tables, references for writing lab reports, molecular animations, and relevant current events.

Facebook is not your friend. As much fun as this social networking site can be, it has led to the embarrassment and downfall of many new teachers. If you cannot cut the Facebook cord completely, there are two simple rules to remember. First, your students are not your friends. You can choose to accept their friend requests after they graduate, but ignore them while they are still in your classes. As for your page's content, use the "SPP rule." For any picture, wall post, or personal gem on your page, ask yourself whether you would you be comfortable sharing it with your students (s), their parents (p), and your principal (p). If not, take it down. With privacy settings constantly changing and teenagers becoming more web savvy by the day, nothing is really private anymore.

As scientists, we are keenly aware of technology's effect on discovery—imagine our field without digital microscopy, satellites, or the internet.

Take a webquest. A simple web search may find hundreds of websites for any given topic; a "webquest" is a way to help your students navigate the best ones. Develop a set of questions that accompany three to five good websites about a particular topic. Choose sites from credible sources with colorful images, good animations, and engaging side links. You have significant flexibility here for guiding students' discovery to specific outcomes, and along the way, they will find engaging content to pique their interest and curiosity.

Get creative with projects. Use your students' tech-savvy skills to your advantage by tweaking your projects to include a digital option. My chemistry students develop YouTube music videos for final exam topics, and my marine biology students create a "Critter Twitter" to discuss the behavior and ecology of a particular marine animal. Projects such as these give you an opportunity to use varied assessments and give your students a chance to get creative in a medium they are comfortable with.

If you can embrace the digital age, you will find it has much to offer both you and your students.

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The New Teacher's Toolbox

November 2010, Tips and Strategies for Teachers Just Starting Out

Michael Romano

When Silence Is Not Golden

Silences can be quite uncomfortable, and in front of a classroom of students, 10 seconds can feel like an eternity. Class participation is tricky because it depends on several complicated dynamics. One factor is the personality of students, over which you have little control. Another is the time of day: First period classes are often a struggle, as are the "food coma" classes right after lunch.

Ideally, many students will consistently volunteer in class, but a classroom community such as this takes much time, skill, and effort to build. "Cold calling" at random is a popular technique with many teachers, but it is surprisingly easy to favor certain students and exclude others using this method. Here are some strategies you can use to ensure that participation in your classroom is measured, fair, and encouraged.

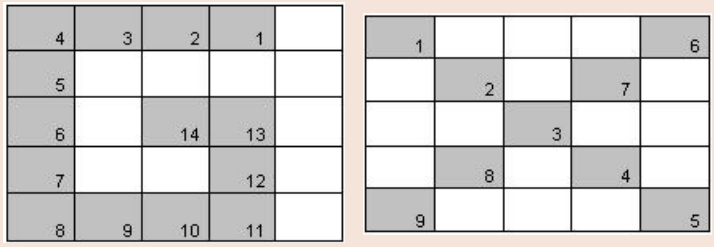
Beware "The Lone Raiser." We all have at least one of these students. He or she is usually bright, often knows the correct answer, and will raise his or her hand for every question. Unfortunately, this student is often the only one who raises a hand. As tempting as it may be, don't default to this quick hand. Students will be less likely to volunteer if they know you will ultimately call on The Lone Raiser, so take a deep breath and use the full wait time of at least three seconds or more (Rowe 1972).

Write it out. Some students may like to answer questions, but miss out on the opportunity to do so because they cannot think of an answer quickly or put their thoughts into words. Have students jot down an answer in their notebooks, and then ask for volunteers. These students will be more willing to participate now that their thoughts are written out.

"Stick" to it. Sometimes cold calling can be helpful. Write each student's name on a craft stick and put it upside-down in a beaker on your desk. When you need a volunteer, pick a stick. This eliminates selection bias. Place the used sticks in a separate beaker to ensure that all students are eventually chosen. Or, use one beaker and return the sticks each time. This keeps students on their toes, as they might be called on again!

Pick a pattern. Minimize bias by arbitrarily choosing a pattern at the beginning of class that establishes an order in which you will call on students. This could be a shape, a letter of the alphabet, or any pattern that's easy to remember (Figure 1). Vary the pattern each day.

FIGURE 1
Two sample patterns for calling on students.



Show the replay. Oftentimes, the best way to evaluate your teaching patterns is to do so as an outside observer. Videotape one of your classes and then watch it, focusing on how you call on students. Or, better yet, have a trusted colleague or mentor sit in on one of your classes. This observer can calculate your wait time, tally how many different students speak, and make note of subconscious biases, such as favoring one side of the room or a certain gender.

Create community. This is perhaps the most valuable strategy for optimizing class participation—but it also requires the greatest energy. The goal is to create a space where all students feel comfortable volunteering and can risk being wrong without embarrassment. This is no easy feat, but a good first step is to encourage participation from the first day of class. Praise students for volunteering, but be mindful of rewarding incorrect answers; there is a distinct line between correcting misconceptions and encouraging students to take a risk and answer a question. If a student laughs at or mocks another student's answer, be quick to address it. This sort of behavior can quickly erode the kind of community you are trying to create.

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