

Resources for recruiting the next generation of middle and high school science teachers

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With the growing problem of not having enough qualified science teachers at the middle school and high school levels, the Illinois Section of the American Association of Physics Teachers (ISAAPT) is ramping up to recruit the next generation of physics, chemistry, biology, environmental science, and earth & space science teachers. They won't be doing this alone. They are enlisting the aid of other science teacher associations in the state. The ISAAPT has created both a model recruitment brochure to be distributed to physics students, and recruitment guidelines to be distributed to science teachers. You will find here the texts of these documents in the hope that science teacher organizations everywhere will use these as templates for appropriate action.

During its spring meeting in 2004, the Illinois Section of the American Association of Physics Teachers established an Ad Hoc Committee for High School Physics Teacher Candidate Recruitment, Preparation, and Retention. Using a \$500 grant from the AAPT national office to provide support, the Committee went on to host two-day pre-meeting session at Illinois Central College in East Peoria prefatory to the two-day autumn Section meeting held a few miles away at Bradley University in Peoria. The pre-meeting session consisted of a review of research findings that several ISAAPT members and non-members had gathered during the intervening six months. The findings, along with an extensive set of recommendations by the Committee, have been fully documented and presented in the pages of JPTEO (Wenning, 2004).

Since their first meeting, the ISAAPT Ad Hoc Committee has been very active, and has begun to involve the membership of the Chicago Section of the AAPT, as well as others. During a joint autumn 2005 meeting at Riverside Brookfield High School in Riverside, members of the Illinois and Chicago Sections carefully reviewed and made recommendations for improving a draft Committee-generated recruitment brochure. (See Appendix 1, *Become a High School Physics Teacher: Think about it!*). Hundreds of draft copies of this brochure already have been distributed in Illinois high schools, and physics teachers are asking for additional copies to distribute.

During the spring 2006 Section meeting of the ISAAPT held at Illinois Central College in East Peoria, a Cracker Barrel discussion was conducted during which nine ISAAPT members representing a wide range of physics teaching and teacher preparation experts generated a listing of critical things to keep in mind when recruiting prospective science teacher candidates. This discussion culminated in the production of an 8-page recruiting guidelines booklet. (See Appendix 2, *Recruiting the Next Generation of Middle and High School Science Teachers*). This booklet was reviewed and approved at a July 18 ISAAPT Council retreat held on the campus of Illinois State University.

The ISAAPT is now working diligently with other Illinois science teacher groups in an effort to get teachers from other disciplines to recruit more middle and high school science teacher candidates. Whether or not this approach will prove effective is debatable – but one thing is not. Science teachers will now be asking qualified candidates to consider careers in science teaching. From a 2004 study by the ISAAPT Ad Hoc Committee, it is clear

that teacher recruitment does not figure prominently in student decisions to become science teachers. When asked “Why not?”, nearly all candidates noted that their science teachers had never asked them to consider becoming involved in science teaching careers. It is hoped that, armed with the recruitment brochure and a set of guidelines, this oversight will be corrected.

The complete text of both brochures can be found in the appendices following this article. Formatted versions of the brochure can be downloaded in PDF from the Illinois Section’s Teacher Pipeline web page at <http://phy.ilstu.edu/pipeline/> or from the Sections “Teach” web site that is referenced in the student-oriented recruitment brochure as well as the teacher’s guidelines: <http://isaapt.org/teach/>.

References:

Wenning, C.J. (2004). Repairing the Illinois high school physics teacher pipeline: Recruitment, preparation, and retention of high school physics teachers. *Journal of Physics Teacher Education Online*, 2(2), 24-32.

Appendix 1

Become a High School Physics Teacher: Think about it!

There is a strong, persistent, and growing demand for good high school physics teachers in Illinois and across the nation. Many positions will go unfilled unless more individuals decide to pursue this career. According to the U.S. Department of Education, within the next ten years half of all current high school teachers will have to be replaced due to retirement and transfers. Physics teaching in Illinois will be similarly impacted. You can make a difference.

Good reasons to become a high school physics teacher

IMPACT Teaching physics will allow you to help some of our most able high school students learn how to solve problems and think critically. You can play an important role in students’ education and have a positive impact on their lives.

RESPECT Teaching demands creativity and hard work. Many teachers have the freedom to develop their own course content and instructional methods. As a teacher committed to students and their learning, you'll be recognized for your expertise and positive influence.

FLEXIBILITY A teacher's work schedule is punctuated with a number of break periods each year. Teaching often provides an extended time for rest and relaxation, special trips, and a variety of exciting professional development opportunities open only to teachers. This is something that few other professions provide.

SATISFACTION Physics teachers have many "toys," so teaching can be a fun and rewarding profession. You'll spend much of your time dealing with and teaching interesting natural phenomena often to your school's best students. While the work associated with teaching is at times difficult, satisfaction the effort brings is considered by many to be worth more than money.

SECURITY High school physics teachers are in demand across the country, and this leads to excellent job security. Teaching certificates issued by Illinois have "reciprocity" with about 40 other states. You can teach almost anywhere in the nation.

LEARNING Teaching a subject is one of the best ways to learn it. As you teach, you'll learn much about the content of physics in particular and the processes and nature of science in general. This is a rewarding experience that benefits both teacher and students.

INCOME Teaching even at entry-level can be financially rewarding. The best new physics teachers with Bachelor's degrees typically earn \$30,000 to \$50,000 per year for a nine-month contract. Salaries often rise rapidly. In large cities, and after earning a Master's degree, teachers sometimes make more than \$100,000 per year as they approach retirement! In addition, there are many job benefits ranging from medical, dental, and life insurance, to tuition reimbursement for graduate courses and retirement plans.

What are the job prospects for a new high school physics teacher? In a single word, excellent. Check out details in the United States Department of Labor's Occupational Outlook Handbook. <http://www.bls.gov/oco/>

How much do teachers make in my area? What are the benefits? Do school districts offer bonuses? Use Salary Wizard to find out about your financial prospects as an Illinois physics teacher. Check it out at Salary.com. <http://www.salary.com>

Where can I find out more about teaching high school physics? Start by talking with your high school physics teacher. Because every teacher and each setting is different, you can get an even wider perspective on high school physics teaching by visiting the Illinois Physics Teacher Pipeline Web site. <http://www.phyilstu.edu/pipeline/>

What it takes to become a good high school physics teacher Teaching demands more than just caring about students and knowing one's subject well. Teachers need to know what motivates students, how to diagnose their strengths and weaknesses, and how to create environments in which they can learn.

Altruism – Good teachers are dedicated to their students and their learning. The best physics teachers will educate the whole student.

Interest – In order to teach well, physics teachers should find their subject matter interesting.

Understanding – In addition to knowing physics well, physics teachers need to have a proper understanding of the nature and history of science.

Ability – Good physics teaching requires that physics teachers not only be able to solve textbook problems, but be good experimentalists as well.

Effort – Being a good physics teacher requires hard but rewarding work – from preparing to become a teacher to actually doing the work of teaching. Do you have what it takes to be among the best and brightest teachers in the nation?

How can I become a high school physics teacher? To become a high school physics teacher, you'll need to complete a Bachelor's Degree in physics teacher education. This will take about four years. You will study physics, mathematics, and a wide range of other science subjects such as biology, chemistry, earth & space science, and environmental science. You'll take courses in physics teaching methods and professional education. Physics teacher education programs exist throughout the State of Illinois that can help you become the physics teacher you want to be. The following institutions within the state of Illinois are actively involved in physics teacher preparation:

To learn more about the above institutions, visit the Web site of the Illinois Section of the American Association of Physics Teachers at <http://isaapt.org/teach/>.

Appendix 2

Recruiting the Next Generation of Middle and High School Science Teachers

We need your help to inspire, identify, and recruit prospective science teacher candidates.

A Guide for Recruiting Science Teacher Candidates

Recommendations from the Illinois Section of the American Association of Physics Teachers

Something needs to be done to address the growing problem of not having enough qualified science teachers for our middle and high schools. Fortunately, there is a large supply of interested and altruistic individuals – today’s science students – who can and will join the science teaching profession if only someone will encourage and promote this career selection. Without support from in-service teachers and community college and university science faculty alike, solving the science teacher supply problem will not be possible. Your assistance is critically needed and strongly requested. The purpose of this guide is to help you – the in-service middle or high science teacher – to inspire, identify, and recruit the next generation of science teachers.

A Looming Crisis in School Science Teaching

In 2000 *Newsweek* noted with alarm that by 2010 half of all schoolteachers are expected to leave the profession due to retirement, relocation, and personal or family circumstances. Of even greater concern is the expectation that 40% of all high school science teachers will leave the profession during the latter half of the decade. This is due in large part to the fact that many of today’s science teachers are members of the “baby boomer” generation who started teaching in the 1970s. There is no way that the loss of experienced science teachers can be stopped, and it certainly is not desirable to reduce the number of students enrolled in science courses or increase class size.

With a loss of experienced science teachers and growing enrollments in secondary school science courses, more and more new science teachers will be needed to bridge the gap. In the State of Illinois, a significant number of science teaching positions are filled by cross-over science teachers (e.g., biology teachers with little or no physics background providing physics instruction). According to the State of Illinois, 2500 teaching positions will need to be filled by qualified science teachers during the next five years. The number of science teachers graduating from preparation programs is far less than the necessary 500 per year.

Inspiring Science Teacher Candidates

Most students make career choices on the basis of pertinent experiences and personal interest, and many students decide to become teachers before entering high school. Most of today’s students will consider a career in science teaching, but only if provided with inspirational activities, proper encouragement, and suitable information. Science teachers at all levels, therefore, would do well to encourage their students to aspire to the profession and provide them with all the resources they need to make an informed career choice. To help students understand whether or not they have what it takes to become a successful science teacher, they should first and foremost be provided with pertinent experiences that can help them develop personal interest in a science-teaching career:

- Experience good science teaching... Good science teaching consists of a hands-on, minds-on approach that puts and keeps excitement into the learning process. Exemplary science classrooms will have a learning environment that is student centered, knowledge centered, assessment centered, and community centered. The classroom should be student centered to the extent that the teacher helps students construct knowledge and understanding on the basis of experience. The classroom should be knowledge centered to the extent that the teacher helps students develop an organized understanding of important concepts and processes in the science discipline. The classroom should be assessment centered to the extent that the teacher makes students’ thinking visible so that ideas can be tested and verified. The classroom should be community centered to the extent that students work under conditions where learning with understanding is valued, and that students are free to explore what they do not understand. Good science teaching will be inquiry oriented, and provide opportunities for students to learn from plentiful and varied learning experiences. Such classrooms will include authentic inquiry lessons and labs, interactive demonstrations, and instruction that clearly connects science concepts to everyday phenomena and the lives of students.
- Experience teaching first hand... Nothing gets students thinking about a career in science teaching like experiencing the teaching process first hand. Inspirational settings will include student participation in various teaching practices that are both age and ability appropriate. Simple in-class activities might include student-to-student tutoring, team teaching, class presentations, role-playing and cooperative learning activities. More advanced students might lead others in a lab activity, demonstration, or discussion. Outside-of-class activities might include using advanced students as lab assistants for introductory-level science courses; having students create lessons or labs; having students set up and take down labs; having students critique teaching, handouts, labs, and tests; having students write questions for a test; and having students build and use demonstration devices in class, with younger school children, or at a science open house. These are just some of the many activities that can provide students with first-hand teaching experiences. Any of these activities can be helpful in getting students to gain confidence in the belief that they are suited for a career in science teaching.
- Experience situations that encourage teaching careers... It is very important for teachers to get their students thinking about science-teaching careers before directly asking them to consider it. To do this, teachers can include any of the following classroom practices: speaking positively about the rewards of science teaching, addressing misconceptions about teaching as part of regular classroom activities, handing out informational brochures dealing with science teaching

careers, and helping students see the need for new teachers and how they can make significant differences in the lives of others. Outside of class, teachers might consider bringing up the idea of a science teaching career at a science club meeting, organizing presentations about science teaching during career day events, speaking about science teaching at parent-teacher organizations, or forming a future teachers group at school. Lastly, teachers might consider taking selected students to a teaching conference at the local, state, or even national level, and encouraging students to enroll in summer science camps at local community colleges or universities – especially those with teacher education programs.

Identifying Qualified Science Teacher Candidates

Not every person is cut out to be a teacher, let alone a high school science teacher. As science teachers looking to recruit the next generation, we must keep in mind that a personal invitation is often pivotal in a student's career choice. Still, we must carefully consider who it is that should be recruited for these important positions. From a reflection on many years of science teaching and teacher candidate preparation, ISAAPT-affiliated science teachers, science teacher educators, science department chairpersons, and high school administrators have identified five criteria that they believe are crucial for informing a selection process that is geared toward obtaining the best possible secondary-level science teacher candidates. Teachers should ask themselves the following questions about a prospective teacher candidate before personally encouraging a student to become a high school science teacher. Teachers should be able to answer "yes" to all of the key questions and most of the follow-up questions before encouraging a student to consider a career as a high school science teacher:

- Does the student have good interpersonal skills? – Does the student exhibit an altruistic, confident, and outgoing personality? Is the student well liked by peers? Is the student helpful, empathetic, and patient? Is the student a good speaker as well as a good listener? Does the student have a good stage presence and a sense of humor? Does the student demonstrate a cooperative attitude and a positive outlook? Is the student open to new ideas? Teachers are first and foremost communicators; good interpersonal skills are a prerequisite for good teachers.
- Does the student have an interest in science? Is the student enthusiastic, and show interest in science subject matter? Is the student serious about learning, and a consistent performer? Is the student an active participant in class who appears to be strongly motivated to learn and who is capable of doing so? Does the student think critically about what the teacher and other students say? Does the student regularly ask questions? Does the student sometimes come

into the science classroom early or after school just to talk, or otherwise appear to enjoy speaking with the teacher one-on-one? The best science teachers are passionate about their subject matter.

- Does the student understand the content, processes, and values of science? Is the student knowledgeable about the subject matter of the course? Does the student strive for conceptual understanding and not merely memorize for the sake of testing? Is the student able to approach and solve problems systematically? Is the student a capable and active inquirer in the laboratory setting? Does the student demonstrate appropriate scientific values such as curiosity, skepticism, objectivity, and intellectual honesty? Does the student understand the nature of science? Only those who understand science can pass on this understanding to others.
- Is the student conscientious? Does the student possess the intellectual and moral virtues required to be a teacher? Is the student mature, dependable, and trustworthy? Is the student level headed – calm in stressful situations – and able to adapt to new and changing conditions? Is the student able to multi-task without getting confused or frustrated? Is the student hard working, persistent, and committed? Does the student follow through on commitments and obligations? Is the student present on time and ready to start work? Individuals who are committed to their students and their work, make the best teachers.
- Is the student a leader? Is the student able to lead a group of peers and effectively challenge and motivate them? Is the student able to work well with others to get things done? Does the student demonstrate an appropriate amount of independence of thought and action? Is the student creative, well organized, and a good time manager? Does the student learn from interpersonal experiences? Is the student rightfully confident of his or her leadership abilities? Good teachers will lead by example rather than coerce desired behaviors.

Recruiting Science Teacher Candidates: Ten Steps

Once prospective teacher candidates have been identified on the basis of observations and other evidence, it is time to directly recruit those individuals for possible careers in high school science teaching. It is suggested that a sequence of ten steps be followed over the course of one or more discussions:

1. Sincerely point out to the student that he or she possesses those intellectual abilities and character traits most closely associated with being a good science teacher.
2. Ask the student if he or she has ever considered a career in the area of high school science teaching.

3. Tell your personal story – why you wanted to become a teacher and what it has meant to you and others.
4. Speak positively about science teaching as a career, but be honest and frank about difficulties associated with the job.
5. Appeal to the student’s sense of altruism and how he or she can make a meaningful difference in the lives of others. Teacher candidates point to this factor as being one of the two primary reasons why they want to become teachers – the other is having had several satisfying teaching experiences.
6. Encourage the student to consider seriously a high school science-teaching career. Don’t attempt to force a decision; it might take some time before the student can decide.
7. Share the companion brochure to this guide titled *A Career in Science Teaching? Think about it!* (<http://isaapt.org/teach/>) and briefly summarize its contents. Answer any questions that the student might bring up.
8. Make certain that the student knows where to turn for additional career information such as school counselors and Web pages. Be certain that the school counselors are engaged in and positively support the teacher candidate recruitment process. See the resources section of this brochure for national and regional teacher Web sites.
9. Suggest specific university programs to investigate, but don’t overlook the potential of working with local community colleges, many of which are feeder schools for universities with science teacher education programs.
10. Encourage undecided students several times over the course of several weeks or months to consider a high school science-teaching career. Sometimes a student won’t realize he or she has a vocation in high school science teaching unless he or she hears about their potential repeatedly and from a variety of different sources. Coordinate recruitment efforts with other science teachers and families. Have students speak with these science teachers and their parents or guardians to get their perspectives.

Community College and University Participation

Community colleges and universities have a number of critically important roles in the recruitment of high school science teacher candidates. Without programs of excellence, it is doubtful that enough qualified high school science teachers will be prepared. Post-secondary teacher education institutions should:

- offer an exemplary program leading to science teacher certification, and promote that program with appealing Web pages, posters, and brochures.
- get undergraduate college or university students involved as teaching or laboratory assistants, or in science education outreach projects.
- seek and obtain grant funds for summer camps for high school students that have science teaching careers as one focus
- nurture science teacher education majors by providing

appropriate clinical experiences, specialized advisement, and ongoing support.

- encourage qualified students who seem to be losing interest in a science major to consider a science-related teaching degree instead.
- avoid thinking that the best science teaching majors are “too good” for science teaching in high schools.

Recruiting the next generation of high school science teachers can make a difference with your help. As a science teacher, you must not underestimate the value of your inspiration and recommendation on a student’s decision to become a high school science teacher. If the growing trend of not having enough high school science teachers is to be reversed, it is critically important that you – a science teacher – become actively involved in the teacher candidate recruitment process. It is you who has daily contact with those students most likely to consider careers in high school science teaching. It is you who gets to know students and their qualifications for becoming science teachers. It is you who has an influence and can impact a student’s career choice perhaps like no other. It is you who will make a difference in determining whether or not future high school students will have enough authentically qualified science teachers.

Valuable Online Resources

A variety of Web pages are available that can serve as valuable informational resources for students wanting to make informed career choices. Web pages can also provide critical information for science teachers involved in the recruitment process. We recommend that teacher become familiar with the information found on the following Web sites:

Illinois Section of the American Association of Physics Teachers. Visit this site to obtain a PDF version of the companion brochure that is referenced in this guide, *A Career in Science Teaching? Think about it!* <http://isaapt.org/teach/>

U.S. Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook* <http://www.bls.gov/oco/ocos069.htm>

ERIC Clearinghouse on Teacher Education, ERIC Digest #19, *So, You Want to be a Teacher* <http://www.ericdigests.org/pre-925/want.htm>

Find out public school teacher salaries across the State of Illinois by examining *The Champion’s School Salary Database* <http://thechampion.org/>

And don’t forget to work with your high school counselors.

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