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NOVICE SCIENCE TEACHERS: EXPECTATIONS AND EXPERIENCES
Scott B. Watson, Liberty University

Introduction

Teacher retention is a problem of national concern in our educational system today. Researchers indicate that the greatest attrition rates are occurring with beginning teachers (Inman & Marlow, 2004; Patterson, Roehrig & Luft, 2003). Brickhouse & Bodner (1992) indicate that the first few years are the most difficult, and some districts report losing 40% of their novice teachers within the first two years. Kelly (2004) reports a similar figure, indicating that more than a third of beginning teacher leave within the first three years, and almost half leave in the first five years. Current research has begun to provide some understanding of the difficulties that beginning science teachers face in the education profession.

Compared to teachers of other disciplines, beginning science teachers encounter more complex challenges in planning and teaching each day (Sanford, 1988). In order to effectively plan and conduct instruction, science teachers must make a variety of decisions about what to teach, how to teach it, as well as what to evaluate and how. In addition, teaching assignments for beginning science teachers are often such that they must plan and improvise curriculum for several different fields of science at once. Many times these are poorly matched with the teacher's own academic content preparation and field experiences (Ingersoll, 2003; Sanford, 1988).

A recent NSTA survey reported that the top two reasons for science teachers leaving the profession were dissatisfaction caused by poor administrative and other forms of support, and poor salaries (NSTA, 2000). Other common reasons for leaving the teaching field include student discipline problems, lack of faculty influence, poor student motivation, and poor opportunities of advancement (Ingersoll, 2003).

In a study of thirty-five New York public school teachers, Blase and Greenfield (1982) determined three central dimensions of the teaching profession, in which most struggled during their beginning years. Instructional mastery, classroom control, and social relations with the students were of largest concern, and many of the teachers believed that mastery was achieved after a period of approximately three years. With little prior experience to rely upon, the teachers reported that work consumed almost all of their personal lives, and many often felt frustrated, confused, isolated, and even depressed.

Background and Purpose

This project grew out of concerns expressed by several novice teachers about their lack of preparation to deal with common problems in the classroom. Specifically, a group of first and second year teachers at a high school in eastern North Carolina began to meet informally after several new teachers left their positions early in the 1995-1996 school year. They found that they were experiencing many of the same problems, and they eventually formed a support group to deal with their situation. Specific concerns expressed by the group included a lack of preparation for the endless paperwork that teachers are required to complete and for the many changes in schedules and placements during the first several weeks of school, and inability to deal effectively with management and discipline issues. They were also concerned about the lack of mentoring from experienced teachers, even though mentors were supposedly assigned to new teachers. After several organizational meetings, members of the group made presentations to their school administrators, to their superintendent, to the dean of the local school of education, and finally to representatives from the various teacher education programs within the university. Many of the questions on the survey developed for this study came directly from the meeting with representatives from the university.

The purpose of this study was to gather additional information about concerns and problems experienced by novice science teachers. It was hoped that this information would eventually be used to further refine the science teacher education program at East Carolina University, and that information gathered would also be used to help active teachers in the schools. It should be noted that many of the changes recommended by the group of novice teachers were already in the process of being put into effect when the teachers expressed their initial concerns. It is also realistic to believe that the changes were accelerated, perhaps greatly so, by what should be seen as a very courageous group of new teachers.

Instrumentation

The questionnaire for this study was developed from two sources. The major source was the list of problems and concerns expressed by novice teachers as described in the preceding section. The second source was other surveys developed for similar studies. After an initial questionnaire was developed, it was circulated among several university level science educators for comments and for eventual content validation of the instrument. One of the few substantive suggestions had to do with the length of the instrument. Interestingly, none of teachers who have completed the questionnaire have mentioned that it took too long to complete. There are two slightly different forms

of the instrument; one is meant to be administered before school actually begins, and the other is given as a follow-up at the end of the first school year. These were administered within a week after school ended. An interview protocol was also developed from the follow-up instrument. Final interviews were conducted by the researcher at the end of the second year. Interviews were taped for later transcription.

NEW SCIENCE TEACHER QUESTIONNAIRE

Personal Strengths and Weaknesses

1. What do you see as your greatest strength as a new science teacher?
2. What do you see as your greatest weakness as a new science teacher?
3. On a five point scale (with five being the highest), how successful do you expect to be as a first year science teacher?

Preparation

4. In what ways do you feel that your college classes and related field experiences have best prepared you to be an effective science teacher?
5. In what ways do you feel that your college classes and related field experiences have least prepared you to be an effective science teacher?
6. If you could change the way you were prepared as a science teacher, what would you change?

Support

7. What kind of support do you expect to receive from other teachers in your school?
8. What kind of support do you expect to receive from your school administrators?
9. What kind of support do you expect to receive from county office or school district personnel?

Teaching Situations

10. How would you describe the ideal science teaching situation?
11. How do you expect your teaching situation to differ from the ideal?
12. If your teaching situation differs greatly from what you see as the ideal, how will you cope with it?
13. What do you expect to be your greatest problem as a new science teacher?

Relationships

14. Describe the nature of your expected relationship with your students.
15. Describe the nature of your expected relationship (if any) with your students' parents.

Daily Instruction

16. Describe what you expect a typical class period will be like for students in one of your science classes.
17. How large a role do you expect laboratory activities to play in your everyday teaching?
18. How do you plan to maintain classroom control during your first year of teaching?
19. How much do you expect to be governed in what you teach by state competency guidelines, including end-of-year testing?
20. How much time do you expect to spend per day in planning for instruction?

Sample

The original sample included all six of the graduates of the undergraduate science education program at East Carolina University for spring, 1996. Two of the six ended up taking jobs over 250 miles from the university, making it impractical to visit and observe them. Another of the beginning teachers resigned after one month of

teaching, mainly due to classroom management and discipline problems. All three of the remaining participants in this study were white females. They were all traditional students who had completed a Bachelor of Science degree in Science Education. They had strong backgrounds in the sciences (60 plus hours), and all were excellent students with high grade point averages (above 3.5 on a 4 point scale). Pseudonyms are used in the presentation of findings.

Annie was predominantly a biology teacher, Ellen was a chemistry teacher, and Toni was an earth science teacher who also regularly taught chemistry. All three taught in block scheduling situations, and all taught at least a few science subjects other than their main area of concentration. They were employed in three different school districts in eastern North Carolina. All were assigned experienced teachers as mentors, but the mentors were not all science teachers.

Findings

Selected responses from the teachers that took part in the study are shown in Table 1. Responses to the initial questionnaire are shown in normal type, responses to the follow-up questionnaire are underlined, and responses to the interviews are in italics. Questions are from the initial questionnaire.

Table 1: New Science Teacher Questionnaire

Responses from “Annie”	Responses from “Ellen”	Responses from “Toni”
1. What do you see as your greatest strength as a new science teacher?		
*love for people and science <u>*ability to introduce a concept, cover it thoroughly, and come up with an activity to reinforce it</u> <i>*ability to provide a realistic application of experience relating to the concept.</i>	*my organizational skills <u>*discipline!</u> <i>*Discipline is a must. I have strict policies.</i>	*course content knowledge <u>*knowledge of the material</u> <i>*I have developed a good ability to provide a realistic application of experience as it relates to delivering instruction.</i>
2. What do you see as your greatest weakness as a new science teacher?		
*lack of experience with real students <u>*leaving out too much detail.</u> <i>*inexperience and lack of time to cover everything</i>	*lack of materials, not having planned for classes far in advance <u>*planning</u> <i>*lack of lesson plans for chemistry classes</i>	*planning <u>*ability to try new approaches</u> <i>*trying to incorporate different styles of learning into lessons</i>
3. On a five-point scale (with five being the highest), how successful do you expect to be as a first year science teacher?		
*maybe a 3 (average) <u>*3.5. There is always room for improvement.</u> <i>*I may have rated myself low because I was having too much success too soon.</i>	*4 <u>*4</u> <i>*There is still room for improvement and experience.</i>	*About a 3. I would like to be a 5, but I feel with all of the preparation time, it’s hard to be creative with lessons. <u>*4</u> <i>*now 4-5, I have had good report.s.</i>
4. In what ways do you feel that your college classes and related field experiences have <u>best</u> prepared you to be an effective science teacher?		
*science content classes expanded and strengthened my knowledge of the subject <u>*science classes definitely helped for the obvious reason of content knowledge</u> <i>*Being placed with an excellent science teacher was especially important.</i>	*They taught me how to make science exciting <u>*Experience teaching has taught me more about teaching than four years of college</u> <i>*start with field experience early (freshman class maybe)</i>	*I feel comfortable in the classroom, which came from student teaching. <u>*college classes did not prepare me</u> <i>*I feel well prepared in my main concentration area, but I lack knowledge in the other areas.</i>
5. In what ways do you feel that your college classes and related field experiences have <u>least</u> prepared you to be an effective science teacher?		
*too much theory and no practice <u>*there are many things that cannot be</u>	*I never had a class mention what to do on the first day of school, etc.	*planning and knowing how much time and detail it will take to explain things

<p>taught</p> <p><i>*Reading and media courses least prepared me</i></p>	<p><i>*classes told the good side of teaching and often left out the more realistic side</i></p> <p><i>*lack of preparation in the role of the End Of Grade test</i></p>	<p><i>*I felt the least prepared in planning.</i></p> <p><i>*more time in the actual classroom</i></p>
<p>6. If you could change the way you were prepared as a science teacher, what would you change?</p>		
<p><i>*need to get in the schools; students and veteran teachers</i></p> <p><i>*more field experiences and longer student teaching</i></p> <p><i>*A broader science (or multiscience) preparation would have been helpful..</i></p>	<p><i>*let the students get into the classroom in the first year in college and actually teach some classes.</i></p> <p><i>*I would have taught in the classroom as a freshman.</i></p> <p><i>*go to a variety of schools for experience</i></p>	<p><i>*spend more time in the classroom</i></p> <p><i>*need more time in the student teaching area</i></p> <p><i>*more time in an actual classroom</i></p>
<p>7. What kind of support do you expect to receive from other teachers in your school?</p>		
<p><i>*expect to receive support to an organized and fulfilling start to the new school year.</i></p> <p><i>*more than I would have imagined!</i></p> <p><i>*wonderful support from colleagues from the start. It is tapering off now.</i></p>	<p><i>*how to handle the everyday tasks such as attendance and other forms.</i></p> <p><i>*excellent!</i></p> <p><i>*always had excellent support from other teachers</i></p>	<p><i>*very supportive and helpful</i></p> <p><i>*I have received wonderful support!</i></p> <p><i>*Veteran teachers still keep a check on me.</i></p>
<p>8. What kind of support do you expect to receive from your school administrators?</p>		
<p><i>*thorough orientation of what to expect</i></p> <p><i>*I am very lucky to have a very supportive and caring administration.</i></p> <p><i>*Important procedures were explained and administrators normally support discipline actions.</i></p>	<p><i>*full support of my discipline in the classroom</i></p> <p><i>*There needs to be a better policy for repeated discipline problems.</i></p> <p><i>*There is a need for improvement in basic discipline problems...more severe consequences are needed.</i></p>	<p><i>*stop during my planning or peek their heads in during classes</i></p> <p><i>*...administrators have given great help and support</i></p> <p><i>*principal was supportive, but I have run into a few intimidating assistant principals</i></p>
<p>9. What kind of support do you expect to receive from county office or school district personnel?</p>		
<p><i>*expect to receive guidance on all business related paperwork</i></p> <p><i>*none</i></p> <p><i>*no actual interaction with the county office</i></p>	<p><i>*pertinent staff development courses</i></p> <p><i>*We attend monthly sessions for beginning teachers, but they are more concerned about statistics than students.</i></p> <p><i>*have monthly meetings that are useless</i></p>	<p><i>*come by to make sure everything was okay</i></p> <p><i>*good support</i></p> <p><i>*meetings for new teachers are effective</i></p>
<p>10. How would you describe the ideal science-teaching situation?</p>		
<p><i>*eager students and no discipline problems</i></p> <p><i>*lab tables, all supplies necessary, boards, space, technology</i></p> <p><i>*my own room, my own materials, eager students</i></p>	<p><i>*where both parties learn from each other</i></p> <p><i>*students who have a desire to learn and equipment that works</i></p> <p><i>*labs that are newer and safer</i></p>	<p><i>*having a teacher in the science department who is not only your mentor but also in your subject area</i></p> <p><i>*modern equipment and money to buy what is needed</i></p> <p><i>*lots of lab equipment and software</i></p>
<p>11. How do you expect your teaching situation to differ from the ideal?</p>		
<p><i>*do not have my own classroom, which means I must be very prepared</i></p> <p><i>*I need more space and my own classroom.</i></p> <p><i>*old equipment, poor computer facilities</i></p>	<p><i>*student apathy, disinterest</i></p> <p><i>*My students (the majority) do not care about school.</i></p> <p><i>*Students don't care!</i></p>	<p><i>*My mentor is wonderful, but her concentration is different from mine.</i></p> <p><i>*Money is mostly available at the beginning of the year.</i></p> <p><i>*lack of money for equipment/supplies</i></p>
<p>12. If your teaching situation differs greatly from what you see as the ideal, how will you cope with it?</p>		
<p><i>*accept that this is my first year and things will not go as planned usually</i></p> <p><i>*I am getting very tired of not having my own room.</i></p> <p><i>*make do with what I have and don't let it bother me</i></p>	<p><i>*plan to make classes as exciting as possible</i></p> <p><i>*The students who do care make me feel like I am accomplishing something.</i></p> <p><i>*try working harder with students...I have actually turned some around</i></p>	<p><i>*by getting general ideas from my mentor</i></p> <p><i>*My situation is not very different from what I think the ideal should be.</i></p> <p><i>*Lab work can't be done because of EOC requirements.</i></p>
<p>13. What do you expect to be your greatest problem as a new science teacher?</p>		
<p><i>*discipline</i></p> <p><i>*not having my own room</i></p> <p><i>*discipline problems (lack of consistency) and not having my own room</i></p>	<p><i>*keeping up with all the school rules and staying ahead with lesson plans.</i></p> <p><i>*student apathy and how to deal with it</i></p> <p><i>*student apathy and delay with paperwork</i></p>	<p><i>*finding time to do all other things I want to do as a teacher</i></p> <p><i>*classroom management</i></p> <p><i>*balancing free time and planning in order to not get stressed out</i></p>
<p>14. Describe the nature of your expected relationship with your students.</p>		
<p><i>*shaky</i></p> <p><i>*My relationship with my students is excellent.</i></p> <p><i>*Students know that if they give me an ounce of respect, I will return it.</i></p>	<p><i>*the kind of relationship where there is respect for each other</i></p> <p><i>*students know I want them to succeed</i></p> <p><i>*Don't let students think you hate them or you have lost them for good.</i></p>	<p><i>*I feel that the relationship will be a good one.</i></p> <p><i>*My relationship with my students is very good.</i></p> <p><i>*The students know that I care.</i></p>
<p>15. Describe the nature of your expected relationship (if any) with your students' parents.</p>		
<p><i>*I want to establish some sort of system (team)</i></p> <p><i>*very open relationship</i></p>	<p><i>*I want them to feel that they can talk to me freely about their child.</i></p> <p><i>*I let them know if their child's progress</i></p>	<p><i>*I hope to contact the parents of my students and begin a good relationship.</i></p> <p><i>*I have positive responses from them.</i></p>

*wanted to contact all parents, but have not	is good or bad. *Most parents are concerned, but I have had a few that were not supportive of me.	*continue to have contact with the parents, but not many calls
16. Describe what you expect a typical class period will be like for students in one of your science classes.		
*I expect my students to experience an orderly, well-paced science class... *An initial assignment in on the board. We go over the assignment...followed by group activity or lab. *try to use a variety of instructional methods every day	*lecture, activity, cooperative learning *check roll, check homework, take notes, watch videos, perform labs and activities *I divide the class into three sections: Homework, notes, and discussion	*will lecture only part of the time and hopefully get students to work well together *activity, notes, individual or group activity, homework *40-45 minutes of lecture, discussion of homework, and examples
17. How large a role do you expect laboratory activities to play in your everyday teaching?		
*expect some type of lab to be present throughout most of the class period *try to do a major lab a week, but activities every day *one major lab a week and group activities and demonstration every day	*2-3 times per week, very important part of learning science *about 1-2 labs a week *one lab per week...EOC cuts down on labs	*I hope to get students in the lab about once a week... *about one for every one or two chapters *about one for every two chapters
18. How do you plan to maintain classroom control during your first year of teaching?		
*create an atmosphere of respect. *rules known by everyone. If a rule is broken, enforce it. *can't display rules because I don't have my own classroom	*firm, fair, consistent *treat everyone the same *Control is not a problem.	*I have set up a plan where after the 2 nd offense, the student will stay after school. *I have a clipboard I have "participation" marked on. *The clipboard still works and it helps to let the students know what I expect.
19. How much do you expect to be governed in what you teach by state competency guidelines, including end-of-year testing?		
*I tend to follow guidelines closely. *give activities and tests that will help them prepare for the EOC test *I do not teach to the test, but I try to gear lessons to the topics on the test.	*100%-accountable *We have a pacing guide that we go by which dictates concepts to be covered. *following the guidelines stifles creativity	*I'm going to teach what the guides for my county state. *Concepts are strictly from the guide for county schools. *concerned with EOC all of the time
20. How much time do you expect to spend per day in planning for instruction?		
*90 minutes during planning period and 3 hours after school! *3 or 4 hours *I previously spent 3-4 hours planning. It is getting better now.	*2-3 hours *1 ½ to 2 hours *Now 1-1/2 hours a day. Not enough, but I want a social life. The school will be waiting the next day.	*at least 3 hours to 4 hours after school. *4 hrs. a day *overall, less time spent planning

Summary

Responses were categorized according to the original design of the instrument, and included personal strengths and weaknesses, preparation, support, teaching situations, relationships, and daily instruction. Several trends were evident with all three of the teachers involved in this study.

All of the participants had a fairly clear view of their original strengths and weaknesses. Both of these categories shifted somewhat over time, changing from basic personality characteristics to instructional expertise. There were several comments in the weaknesses category that pertained to lack of planning, and there was some consistency in this category over time. All three participants flourished in their teaching, and they were generally more successful than they had initially expected. One even commented during her interview that she may have had too much success too early, leading to resentment among other teachers.

All of the beginning teachers felt that they were well prepared by their college classes in their primary content area, but less prepared in supporting areas of science. This is particularly notable because many science teachers must teach science subjects they are not truly equipped for. The teachers did not feel as prepared in terms of their education courses, commenting on lack of experience in planning, routine school activities, and lack of practical rather than theoretical content in classes. Several comments were made by the participants about the necessity of spending more time in the classroom during their preparation as teachers, and these comments did not change appreciably during the study period.

The three participants felt that they had received excellent support from other teachers and administrators in their schools, and research has indicated that this is an important factor in retention of teachers (Patterson, Roehrig & Luft, 2003; NSTA, 2000). Although their initial expectations of support from county office or school district personnel were high, their comments after the initial survey indicated that they had received little assistance. This may simply be a result of not understanding how school systems typically operate.

None of the participants had what they considered ideal teaching situations, ranging from being a “roving” teacher to having inadequate laboratory or computer facilities. All managed to cope with their predicaments, and in the end, were more positive about their situations. Discipline problems were mentioned fairly commonly among the participants, but (interestingly) all three were known to exhibit good classroom management and discipline skills. Interestingly, when the participants listed characteristics of an ideal teaching situation, there was a shift in emphasis from comments that were student-centered to comments about the building and classroom facilities.

Although they might have been shaky at first, all of the teachers also reported that they had good relationships with their students and with parents. They all mentioned respect (or mutual respect) at some point during the study, and this factor seemed to be a real key for them to maintain good relationships. They had also planned initially to have lots of contact with parents, but that expectation was reduced over time.

Finally, they all came to recognize the importance of effective, organized instruction during the term of the study, along with the importance of effective classroom management and discipline skills. This included an emphasis on planning and preparation and adequate knowledge of subject matter. All of the teachers spent several hours per day in planning, with a trend toward less time spent planning toward the end of the study. The dominance of the North Carolina Course of Study and End of Course Testing also demonstrated the importance of accountability in determining instruction, which resulted in severe restriction of labs and activities as part of routine

instruction. All of the participants seemed to be aware of the emphasis on state testing from the very beginning of the study, but they didn't seem to fully understand the role that accountability plays in everyday teaching.

Conclusions and Recommendations

In 2003, seven years after the beginning of this study, all three of the participants were still working as science teachers. Annie had moved to a larger city and was beginning to pursue a doctoral degree (she had completed a master's degree in science education before she began teaching). She was serving as department chair in her new position. Ellen was still teaching in her original school, and was working toward completion of a master's degree in chemistry. Toni had changed schools in her same school district, and she was also serving as a science department chair. She had recently applied for admission into a master's program in counselor education. At present, none these three successful science teachers are no longer teaching. Ellen has taken a job in the chemical industry. Toni is now a full-time school counselor. Annie is pursuing her doctorate full time, and then will probably seek a job in higher education. Specific reasons for leaving teaching are not known, but based on earlier conversations, they probably revolve around issues of job satisfaction, recognition, and compensation. Further research in this area would be a good topic for future research.

Why were these teachers successful? It should be recognized that these were not typical beginning science teachers. They were all exceptionally bright students near the top of their classes academically. They were all prepared in a traditional science teacher preparation program (as opposed to a licensure only or lateral entry program). They also had excellent support from other teachers and administrators in their schools, and they were all willing to make the sacrifices necessary to become successful teachers. Finally, participation in this study helped provide further support for the teachers in terms of contact with university professors and graduate students, which is not the typical model after students complete a teacher preparation program. Although this was not an objective of the present study, it does seem plausible that being part of the study may have served as informal induction program for these teachers. Researchers have reported that participation in induction programs influenced their retention, as well as their development as professionals (Luft, Roehrig & Patterson, 2002; Gold, 1996). As Kelly (2004) reports, induction programs may be one of the keys to improving teaching retention. School districts often run programs for new teachers, but as the teachers in the present study report, they may not provide any real support. Where possible, induction programs should be collaborative efforts between teacher education programs in universities and local school districts. If this is not possible, universities should take more responsibility for supporting and providing

resources for their graduates. Research has indicated that these types of programs can make a real difference (Kelly, 2004; Odell & Ferraro, 1992).

The teachers who originally inspired this research project had no effective support system in place. They tried to create their own informal support group, but it wasn't enough to save the careers of several potentially successful teachers. Several changes in the programs for teachers at East Carolina University grew out of this crisis period for new teachers. Field experiences were totally reorganized and enhanced, with a significant increase in the number of hours in the schools. There was also a shift in expectations during field experiences from pure observations of teachers to more active participation in classroom activities. Programs and courses were revised to make them more practical and less theoretical in nature. In the science teacher preparation program, there was a shift from science preparation based on the science major to a more general approach, with adequate hours of instruction in all of the major science fields. Hopefully we can all learn from our mistakes, and by paying more attention to the needs of beginning teachers and to their special problems, we can create a more supportive environment for this critical group of teachers in the future.

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NOVICE SCIENCE TEACHERS: EXPECTATIONS AND EXPERIENCES

Abstract

This project grew out of concerns expressed by several novice teachers about their lack of preparation to deal with common problems in the classroom. Specifically, a group of first and second-year teachers at a high school in eastern North Carolina began to meet informally after several of their colleagues left their positions early in the academic year. They found that they were experiencing many of the same difficulties, and they eventually formed a support group to deal with their situation. Specific concerns expressed by the group included a lack of preparation for the endless paperwork that teachers are required to complete, unpreparedness for the many changes in schedules and placements during the first several weeks of school, and inability to deal effectively with management and discipline issues. The purpose of this study was to gather additional information about concerns and problems experienced by the novice science teachers. A structured questionnaire was administered to a group of novice teachers before they started teaching, and a follow up questionnaire was administered after one year of teaching. Interviews were also conducted after two years in order to determine what factors helped the teachers survive their first years on the job. Several trends were evident with all three of the teachers involved in this study. They all came to recognize the importance of effective, organized instruction during the term of the study, along with the importance of effective classroom management and discipline skills. This included an emphasis on planning and preparation and adequate knowledge of subject matter. They all felt that they were well prepared by their college classes in their primary content area, but less prepared in supporting areas of science. All three participants felt that they had received excellent support from other teachers and administrators in their schools. They also reported that they had good relationships with their students and with parents. It is hoped that this information will be used to further refine teacher education programs at the university level, and that information gathered will also be used to help active teachers in the schools.