

# Testing the Waters in Teaching: A Qualitative Study on Graduate-Level Intern Science Teachers' Motivations for Entry Into Teaching in Taiwan

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The teaching profession has difficulties in recruiting high-quality science teachers in many countries and many beginning science teachers would leave after their first year of teaching. As Taiwan has recently been able to recruit many graduate-level science students into teachers' training programs, it is important to investigate if these high-quality science graduates would stay in teaching after their first-year internship as intern teachers. A qualitative study was conducted on 22 science intern teachers with master's and doctoral degrees from a comprehensive university, who had just completed their internship. It is found that both positive and negative factors occur during their internship to impact their intentions to stay. However, as the positive outweighed the negative, the majority of them wanted to pursue teaching as a career for their future. Implications of these findings for teacher education and government policy are discussed.

*Keywords:* graduate-level science students, science teachers, motivations, beginning teachers, intern teachers, internship

## Introduction

The shortage of quality science teachers is a serious problem in the field of education. In many countries, the teaching profession had difficulties in recruiting high-quality teachers into their science classrooms (Dean, 1996; Goodstein, 2001; Howson, 2001; Merseeth, 1983; Purchon & Nichols, 1996; Pyke, 1995; Thomson, 1998). Further, in the case of successful recruitment, many beginning teachers would leave their job after their first year of teaching (Darling-Hammond & Cobb, 1995). In the US, it was reported that as many as 20% to 25% new teachers in all subject-matter areas left a school district after their first year (Hawley, 1992). Moreover, both in the US and the UK, those teachers with high-level ability were most likely to leave (Lanier & Little, 1986; Gold, 1996; Sanders, 2001). It was assumed that the first-year attrition for talented qualified science teachers could be worse than the attrition for teachers in other subjects, since these teachers had more career options for other professions with better economic and prestige incentives (Hecker, 1996; Thomas, 1998).

In contrast to the above situation, Taiwan has been able to recruit and retain high-quality science students into teaching for the past few decades with use of a provision of a tuition-free pre-service education and a handsome package of remunerations and benefits (Fwu & Wang, 2002a). In the traditional system in Taiwan, graduates from single-purpose normal teacher training institutions were guaranteed job placements by the

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government and provided the full amount of teacher salary from the first day of their teaching. It was anticipated that they would stay in teaching until they were retired, because they were required to commit at least five years to teaching in return to their free-tuition pre-service education and because teaching was viewed as a relatively well-paid occupation (Fwu, 1995; Lin, 1996). Therefore, there was little difficulty in recruiting and retaining qualified science teachers in the teaching profession in Taiwan.

Following increasing democratization and emergence of pluralism in the Taiwanese society, the Teacher Education Act enacted in 1994 allowed regular universities, other than the normal institutions, to establish new TE (teacher education) programs to prepare teachers. Graduates from these TE programs are required to take one-year full-time student teaching internship as "intern teachers", during which period only a small amount of monthly remuneration (equivalent to one fifth of a regular teaching salary) is provided. After the one-year internship, if these intern teachers wanted to pursue teaching as a career, they then had to compete for teaching positions in an open market (Fwu & Wang, 2002a). The full-year internship is considered by many as a "trial period" to decide if they are fit for teaching.

It was widely recognized that the period of student teaching internship posed great challenges for beginning science teachers (Plummer & Barrow, 1998; Veenman, 1984). These challenges included how to transmit content knowledge through selection of appropriate pedagogical strategies, manage an effective classroom environment and establish rewarding relationship with students (Heath, 1994). Many experienced the so-called "reality shock". Faced with these challenges, some interns might give up, while others might be willing to stay on. For science intern teachers in Taiwan under the new system, it is important to know if they, especially teachers from regular universities, want to stay after the "testing the waters" in science teaching during the internship and what their reasons are. This study, thus, intends to explore the motivations of a group of graduate-level intern science teachers from a regular university for entry into teaching after they finish their first year of internship.

## **Research Design**

### **Selection of Participants**

The study included all the 22 intern teachers, 8 male and 14 female, who had completed both their graduate study in science and the pre-service TE program at a regular comprehensive university in Taiwan, and had then completed a one-year full-time internship in junior and senior high (equivalent to grade 7-12) schools. They had been placed to these schools based on their own choices and openings for internship in different subject areas provided by the schools. They were prepared to teach specific science subjects, including biology (9 participants), earth sciences (3), chemistry (3), physics (1), health science (2), geographic and environmental science (1), food science (1) and engineering (2) (see Table 1). These graduates had to excel academically in order to get into the graduate schools of the university, and they had to further pass a highly competitive screening process in order to enter the TE Program. Therefore, they can be viewed as science intern teachers of high quality.

### **Interviewing Process**

Based on the research questions, an interview guide was developed including the following dimensions: (1) personal background and schooling experiences; (2) pre-service training experiences; (3) environment of the intern school; (4) experiences in science teaching; (5) difficulties encountered in internship; and (6) prospect

for pursuing teaching as a career. In-depth open-ended interviews, each lasting for two to three hours, were conducted with each participant after he/she completed the internship. A life history approach (Josselson & Lieblich, 1993) was adopted in conducting the interviews to get a holistic understanding of participants' life events related to their motivations for teaching science. The researcher further used the techniques of crystallization and confrontation (Maxwell, 1996) to enhance the clarity and trustworthiness of respondents' narratives. In cases of ambiguity, the researcher asked the respondents for detailed and concrete examples and in case of inconsistency, for further clarification and reinterpretation. In this way, the researcher was able to collect significant information on relevant life events surrounding their exploration for future careers and was relatively confident that they did express a full range of their thinking and reasons for becoming a teacher.

Table 1

*Background of Participants*

Gender		Type of school					Field of science teaching						Marital status	
M*	F*	ESH*	RS*	JH*	Biology	Earth science	Chemistry	Physics	Health science	Geographic environmental science	Food science	Engineering	M**	U*
8	14	1	11	4	9	3	3	1	2	1	1	2	4	18

Notes. ESH\*: Elite senior high school; RSH\*: Regular senior high school; JH\*: Junior high school; M\*: Male; F\*: Female; M\*\*: Married; U\*: Unmarried.

**Data Analysis**

Each interview was taped and fully transcribed as the main source for data analysis. Analysis of the data focused on identifying important themes common to the respondents' motivations for entry into teaching. The researcher employed content coding (Miles & Huberman, 1994) to create common themes across individual cases. In reading the transcriptions of each individual's narratives, the researcher grounded the codes in the students' actual languages (Strauss, 1987) in tracking all terms and phrases used to describe their strategies of science teaching, interactions with students and colleagues, their roles as intern teachers in school, difficulties they had in internship, perceptions of teaching as an occupation and their intentions to stay in teaching after the period of internship.

**Research Outcomes**

It was found that after "testing the waters" in science teaching during the internship, 18 (82%) of the 22 intern teachers indicated that they wanted to stay in the teaching profession; only 4 (18%) of them expressed somewhat hesitation. The reasons of those who chose to continue in teaching included the intrinsic satisfaction from science teaching and the extrinsic rewards provided for teachers. The factor that might discourage them was related to difficulties they encountered in school during their internship.

**Intrinsic Reward in Science Teaching**

Many of the intern teachers expressed a high-level of satisfaction with teaching science and interacting with their students in their intern schools. Their ways of reaching these rewarding experiences, however, varied with the types of their schools, including an ESH (elite senior high school), RSH (regular senior high schools) and JSH (junior high schools).

**Teaching at ESH.** Three of the intern teachers, Jun, Geng and Yuling, taught in a so-called "star" girls' senior high school, where teachers were expected to pursue excellence in teaching to prepare academically

outstanding science-track students for further study in science, engineering and medicine at top universities in the country. For the interns, the greatest sense of accomplishment came from a constant interaction with these highly motivated talented students as they raised challenging questions. As Jun, an earth science teacher, said:

Teaching in this school was very demanding—in addition to a solid grounding in the academic discipline you teach, you had to design curriculum that motivated students to explore and to use their creativity. I once gave my students a pile of replicate dinosaurs bones and asked them to assemble the bones into the skeleton frame. By doing this, they had to learn by themselves the principles of Animal Anatomy and used their imagination and creativity to gather the bones into a three-dimension skeleton. They did a great job on the assignment—They were inspired by this combination of knowledge and creativity and got very involved. What they did always exceeded what I had expected and this gave me a great sense of fulfillment.

Geng, a chemistry teacher, enjoys teaching in the same school for students' active responses, challenging questions and critical thinking:

These students really pushed you hard—They were very attentive in class, if you said something wrong, they got you right away, they raised fantastic questions that never came up in your mind before and they made wonderful inferences out of scientific principles that often made you surprised. As a teacher, you really had to broaden and deepen your scope of knowledge in order to satisfy their “appetite” for science and be prepared for something unexpected brought up in the next class. Although it was very challenging, I enjoyed teaching science in this way.

**Teaching at RSH.** For intern teachers teaching in RSH, the focus of their teaching was how to make science accessible to students who had not had a solid grounding from their previous study and to motivate students who thought science was not relevant to their study or daily life. Hsien, a biology teacher, taught science-track students who had problems with understanding abstract concepts, such as homeostasis of blood glucose:

To help students understand, I had to use the analogy of banking to explain the concept. I told them glucose in the blood is like money in your pocket. You need to keep enough amount of money in your pocket to function, just like your body needs enough level of glucose in your blood. When you have a lot of money in your pocket, you can spend or deposit it in the bank, but when you do not have money, you have to withdraw money from the bank. The liver functions like the bank where glucose can be deposited or released to the blood. In this way, I made the abstract concept of “homeostasis” easier for them to understand. When I saw them finally got a hang of it, I felt rewarded.

For teachers who were assigned to teach non-science track (liberal arts and social studies) students, the main challenge they faced was that these students lacked motivation to learn science, because it was not a required testing subject in the College Entrance Examination for them. At the beginning of her teaching, Hui, a biology teacher, found her students paid little attention to her, reading their own books or just daydreaming. She strove to get them interested by making this “irrelevant” subject relevant to their daily life. She decided to focus her teaching on general scientific literacy that was useful to these students. For example, on the topic of digestion, she linked its effect with what the students were most concerned:

On your “big day” of the College Entrance Examination, your parents will probably treat you to a very nourishing big meal during the lunch break. Most of you may think you should take a big bite to give you more energy for the afternoon exams. What will happen after the big meal? In fact, this meal may ruin your exam, because much blood go to your stomach to digest the food and your brain is left with less blood for thinking, so you will feel a kind of stupor. This is what science tells us. So, if you know scientific principles, you can live a better life with such knowledge. Gradually, I found these students got more interested and started to pay attention to issues in their daily life, which could be explained by scientific principles. I felt that my painstaking efforts finally paid off.

Teaching in a vocation-oriented high school, Chai found that his students suffered from an inadequate

science background and a low level of self-confidence, because students in vocational schools were in general considered lower-track. He decided to take an “invention-oriented” approach in his course by guiding students to make products out of ordinary objects in their daily life, so as to make science tangible and enhance their self-confidence:

I encouraged them to “invent” something out of ordinary things around them with simple application of very basic scientific rules. In my class, they learned to make wonderful gadgets, like—turning a regular pen into a multi-function one, an ordinary container to be “hidden” in the wall to save room space or designing a convenient cleaning tool kit. This approach really turned their interest on—They saw that science was no longer a bunch of abstract jargons, but something tangible and useful in their daily life. The idea of being able to “invent” something also made them feel more confident in themselves.

**Teaching at JHS.** Similar to their peers who taught in senior high schools, the intern teachers working in junior high schools also felt rewarded. However, unlike the previous group who acquired satisfaction mainly from implementing an innovative science curriculum and instruction, this group of teachers gained their fulfillment from positive interaction with students, which in turn motivated the students to learn. As Meng, a health science teacher, expressed:

I found these kids really adorable—They were really looking for a “good” teacher to be friends with. My students said they loved me, because I am “pretty” and “nice”. They liked to share their secrets with me. I found that if they liked you, they liked the subject you taught and they would study hard to please you. Gradually I found I used this bonding relationship to motivate them to study harder—and it worked! It was so great to feel that your students studied hard because they loved you!

Yujing, teaching biology in a junior high school, also enjoyed her relationship with her students.

For me, teaching the 7th grade introductory biology course was quite easy—Content was not an issue; it was the relationship I had with the students that mattered. Many teachers in the school scolded and punished students if they didn't study hard, but I tried to understand why they could not perform well and made them feel I really cared about them. Gradually they understood I would feel sad, if they did not make efforts, and they started to study hard. This bonding between us really made me feel great!

### **Difficulties Encountered in Internship**

While most of the participants in our study had relatively positive experiences in teaching science itself, they, nevertheless, encountered difficulties in the managerial, relational, instructional and financial aspects of life as an intern teacher. These difficulties might have a negative impact on their decision to take teaching as their future career.

**Inadequate classroom management.** For these teachers fresh out from the graduate school, how to maintain student discipline in the classroom as a prerequisite for effective teaching was a great challenge.

Yao, teaching in a JHS, struggled on this issue:

At first, I did what I was told in the TE Program—to be patient and caring for the students, never to lose my temper to punish them, but I found this method did not work with some students and things got out of control. Other teachers advised me to be firm and tough. I swung between ideals and reality for some time, but finally I was pushed by the reality of a “chaotic” classroom, and did what I did not want to do—I punished them!

Yiying, teaching in a JSH, felt at loss in the beginning when she encountered students' behaviors beyond her expectation:

I did not know what to do when some students stood up and walked around as I was teaching. It was difficult for me to teach the lesson and tried to maintain class order at the same time. Also, I encouraged students to raise questions in class, but when some students kept asking irrelevant questions, it became quite disturbing, and I did not know what to do. But gradually, I developed my own way of dealing with these problems—I stopped speaking when students disturbed the order and took down those students' names and asked them to stay in school to do homework after class—and it worked!

Although classroom management posed a great challenge to these intern teachers, however, as time went by, they gradually developed a certain way of keeping the class in order and most of them believe that they will do better as their experiences accumulate in the future. However, for a few of them, such as Chiong and Shu, who expressed hesitation to stay in teaching after internship, the dual burden of teaching and classroom management seemed to have entailed extreme pressure and weakened their intentions to be a teacher in the future.

**Perplexity in role-taking.** Many participants in our study expressed a keen sense of perplexity in their role as an intern teacher at the start of their internship. They had to learn hard to go through the transition from being a graduate student who had a free schedule in college to a teacher who worked by a strict timetable in school, from identifying themselves more with students to associating themselves more with teachers and from being a talented student who was encouraged to freely express himself/herself in college classrooms to a junior member under the supervision of senior teachers, who held the power of deciding whether the neophytes were qualified for teaching. Hsien said:

To be a teacher was so different from being a graduate student! The first big change was your time schedule—I used to stay up late and did not have to get up until noon—all of a sudden, I had to get up at 6:00 and arrived at school by 7:10—God, it was so harsh for me in the first three months.

In addition to this adjustment in daily schedule, they had to learn to identify with their new role as a teacher. Shu described:

There was a great gap between a student role and a teacher role. At the beginning, I found myself identifying more with the students than with teachers. I hung around with my students like we were buddies, and sympathized with them when there were confrontations between them and “those” teachers, but gradually, I found if I continued acting this way, it would be hard for me to perform my teacher's role, such as getting students to do homework or abide by rules. It did take me a long time to adjust my role from being a student to being a teacher.

Moreover, some intern teachers found that they needed to refrain their free spirit of doing what they want to in tune with their supervising teachers' approach. Meng expressed:

I cared more about students' understanding of what I taught, but my supervising teacher cared more about finishing up the lessons earlier to leave more time for quizzes—I did not agree with her, but I could not freely express my ideas and argue with her, because she was the one who decided my grades for passing the internship or not—so what I did was to speed up my lessons a little bit, so as to squeeze out some time for quizzes—I really learned hard to repress my way of doing things. But it was just temporary—now I have finished the internship, I will be able to be my own master again!

**Mismatch at instructional level.** Some individuals in this group have encountered a gap between what they expected students to learn and what the students actually learned. This gap derives from two sources: The first is between the level of textbook content and students' prior foundation in science and the second is between the teachers' strong scholastic capacity and students' weak academic background. Guo keenly experienced this sharp mismatch:

I taught an 11th grade chemistry class based on the content in the textbook. But to my surprise, nobody understood what I taught. I tried different ways to teach the concepts—six or seven times—but they still did not get it! I did not know why they did not understand, because it was so basic that they should have learned it in the eighth grade. When I was a student, I usually understood what my teachers taught the first time, or at most the second time—I could not imagine how a person can be so slow at learning science.

Although frustrated by this experience, Guo, however, still wants to become a teacher because he considers teaching “as a relatively attractive occupation with satisfactory material rewards” and for the future, he will “choose a school where the students are much brighter”.

**Difficult financial situation.** During the one-year internship, an intern teacher has to work full-time in school but only receives a very small amount of remuneration. This situation made some who had to live away from home to work underwent some financial difficulty for the year, as Yo said:

I worked in a school away from my hometown, so I had to rent an apartment in Taipei, but how could I do with an allowance of NT\$8,000? I could not even afford to rent a decent room—not to mention food and transportation! My friends had similar problems, so some had to live on past savings and some took part-time jobs to make ends meet.

Under these disadvantageous conditions, the students were not discouraged, because they saw such financial difficulty as only the temporary. To realize a future career with handsome material rewards once they become full teachers, they were willing to endure this temporary disadvantage.

This long-term strategy was also supported by some of their parents, as Hua described:

At the beginning, I was hesitant about going through this one-year internship with so little money—I thought I should get a job with “real” pay, because I was too old to depend on my parents—I already graduated from the graduate school! But my parents insisted that I complete the internship and were willing to support me, because they thought it was a great investment—a short-term sacrifice in return for a life-time job with great benefits.

### **Future Extrinsic Rewards**

For these intern teachers, the prospect of attaining considerable extrinsic rewards as a teacher, including material rewards, time compatibility and social prestige, encouraging them to pursue a teaching career.

**Material rewards.** For many participants in our study, teaching is considered as a “good” career choice because of the relatively better material rewards, including job security, benefits and salaries provided for teachers compared with other similar career options. Several older students stressed the importance of job security offered by the teaching position, as Tseng, who is married and has children, said:

Teaching in our society is considered as an “iron bowl”—You can hold the job until you retire. This provides a great sense of security for me and for my family.

Furthermore, teaching pays well compared with such alternative occupations as civil service work in the government, or work in positions, such as research assistants at universities or as research technicians in private companies. Yujing observed that:

A new teacher with a master’s degree gets paid more than 40,000 NT dollars, much better than an entrant civil servant or a research assistant, who gets only about 33,000 NT dollars—and you know, teachers do not work but get paid over the two-month summer and one-month winter vacation—what a great job!

Teachers also enjoy a good package of benefits, including low interest rate loans, comprehensive health insurance and subsidies for their children’s education. Some of the students in our study are the beneficiaries of these programs themselves, as they are children of teachers. Shu said:

From primary school to college, the government paid half of the tuition and fees for me, my brother and sister. College education costs a lot, if it were not for the educational subsidies for teachers' children, we could not have completed our education.

**Time flexibility.** Some intern teachers consider the time compatibility of teaching with personal pursuits and family life as another important incentive. Chi, major in geographic and environmental science, expressed:

Summer vacation is a great time to "recharge my batteries". With the long vacation, I can travel around many places in the world and see with my own eyes what I have previously only read about in textbooks. These experiences, I believe, will really enrich my teaching and broaden my students' horizon of the world!

Others considered teaching as compatible with their family life, as Sheng, married, with children, said:

I am married with a daughter. I have found it was very important to spend more time with my child. As a teacher, I will have a flexible schedule and be able to spend time with my family.

**Social prestige of teachers.** Another important external incentive for our participants to pursue teaching as a career is the social prestige and general respect ascribed to teachers in Taiwanese society. Sheng, a mid-career changer from military services to teaching, confirms this traditional viewpoint with his observation of the public's respect for teachers nowadays:

Teachers, in general, enjoy higher respect than employees in many other occupations, such as civil servants or military officers. As I change my career from being a military officer to a teacher, many of my friends think it is a step up and they look at me with a little bit more respect, because I am going to be a high school teacher.

This positive social image of teachers is an important factor to attract some outstanding science students in our study to be teachers, as Guo expressed:

As teachers enjoy higher social status in Taiwan, many people are competing for teaching positions. You know, college graduates are now everywhere, you need a master's degree to give you an edge to get a high school teaching job. I think being a high school teacher is an appropriate status for a master's degree holder like me.

Furthermore, it appears that in Taiwan science teachers may enjoy a relatively higher respect from students than teachers of other subjects, owing to the relatively "high status" of basic science in school curriculum. A summary of several students' comments on this point revealed the following:

Physics, chemistry and biology are considered "major" subjects in school, and they are required subjects in all the major examinations and are in general considered very "tough" to learn. Therefore, if you teach these subjects, it means that you must be very "li-hai" (sharp and smart), and this makes students more respectful to us than to teachers of other "lesser" subjects.

## Discussions

### Summary

In conclusion, the decision to stay in teaching for these beginning science intern teachers was based on their understanding of the above three factors, their intrinsic satisfaction with teaching, extrinsic rewards for teachers and difficulties during internship. For a majority of the participants, the first two factors outweighed the third one, and thus strengthened their intentions to pursue teaching as a career. For some others, although the difficulty prevailed over the intrinsic reward, they chose to stay in teaching, because the prospect of ample external rewards for teachers stood out as a main incentive. For the very few who expressed hesitation in



becoming a teacher, the difficulties that they experienced in the real world of a school seemed to foreshadow their intentions.

This study found that a great majority (81%) of these graduate-level intern teachers wanted to stay in teaching after the first year of their science teaching in the real world of a classroom. This result indicated two points worthy of notice. First, unlike the high first-year attrition rate of beginning teachers in the US (Darling-Hammond & Cobb, 1995; Hawley, 1992), this small-scale study showed that the majority of the beginning (intern) teachers in this study intended to stay in the field. Second, although many academically able American and British teachers tended to leave teaching earlier (Lanier & Little, 1986; Gold, 1996; Sanders, 2001), this study showed that these academically able postgraduate-level teachers did not intend to leave.

### Implications

**For teacher education.** It is found that these intern teachers were able to gain intrinsic satisfaction from their teaching, mainly because they were able to tailor their science teaching, according to their students' backgrounds. For those who taught in the ESH, they had to perfect their teaching in both width and depth in order to meet the challenging demands from their students. For those who taught in regular senior high schools, they needed to make science more "friendly" for students with difficulties or without motivation to learn. For those who taught lower grades, they needed to establish an affectionate relationship with their students to attract them to learn science. Therefore, from the above, it seems that an orientation of placing students at the center of science teaching is the fundamental principle of being of a successful science teacher. The flexibility to adapt to a variety of students' needs in different school contexts appears to be an essential capability to realize this principle. It is, therefore, suggested that pre-service science teacher education provides a context, where teacher trainees are assisted in realizing the importance of adaptation to students' needs and developing strategies for teaching science to different groups of students in a variety of school contexts.

**For government.** This study also found that one of the major reasons for these academically talented individuals to stay in teaching is the handsome material rewards provided for teachers in Taiwan. Compared with other possible career options for these graduate science students, teaching was regarded as a better choice given its salaries, benefits and pension programs (Fwu & Wang, 2002b). The salary for a new teacher with a master's degree was 25% higher than the average salary for graduates with similar qualifications working in other occupations (Ministry of Education, 1999). With a two-month summer and one-month winter vacation, teachers are paid a full-year salary with a one and half-month bonus. Teachers' job security was well protected and they enjoyed a handsome government-funded pension program (Fwu, 1995; 2000). In some countries, science majors might find that teaching was much less well-paid compared with other career options and thus tended not to consider teaching science as a career option (Goodstein, 2001; Scherer, 2001; Kirby & Grissmer, 1993). This study shows that it is important for the government to take the initiative in providing competitive remuneration packages in order to recruit qualified science teachers.

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