Exploratorium Teacher Induction Program: Results and Retention

Sara C. Heredia and Julie H. Yu
Exploratorium Teacher Institute
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Abstract

This report details the results of a recent survey of graduates from the Exploratorium Teacher Institute's Teacher Induction Program (TIP), a two-year program for novice science teachers in the San Francisco Bay Area. TIP focuses on science-specific support and on embedding beginning teachers in a professional community of practice. The 24-question survey asked TIP graduates about the types of support teachers felt they received from the program and about their current profession. Of respondents who began TIP before 2010, 91% stayed in the classroom for at least 5 years. Over the life of the program, 73% of graduates are still teaching in K–12 classrooms, 19% are in the education field, 5% are not in the workforce, and only 3% no longer work in education. TIP graduates reported that 81% have taken on leadership roles in their schools, 73% have mentored other teachers, and 61% have provided professional development for their colleagues. Response patterns of graduates suggest the success of TIP is its focus on science-specific support; however, further research is necessary to understand how the TIP bolstered teacher retention.

Introduction

School staffing issues are a growing societal problem, especially in science classrooms. While some have argued that the shortage of science teachers is related to the lack of teachers available to replace retiring teachers, research has shown that the shortage of science teachers is actually related to a lack of teacher retention rather than a supply problem (Ingersoll & Perda, 2010). One answer to the issue of retention has been to provide teachers with induction programs in their first three years of teaching. For example, the California Department of Education funds the Beginning Teacher Support and Assessment Induction, which is a locally designed and implemented support system for newly credentialed teachers in the state.

Induction programs have become an important investment by districts and schools in an effort to keep teachers in the profession (Ingersoll, 2012). An increase in induction programs came in response to reports early in 2000 that estimated that only 50-60% of new teachers remain in the classroom after five years (Ingersoll, 2001; Ingersoll, 2003). However, this increase in induction programs does not necessarily mean that all programs support new teachers in ways that encourage them to stay in the classroom. Induction programs vary in form and include guidance from principals or other department leaders to lighter teaching loads for both mentors and new teachers as they work together to help the new teacher adjust to classroom life. A recent review of the literature on the impact of induction programs shows that they do not all have similar impacts (Ingersoll & Strong, 2011). In fact, programs that provide multiple forms of support have greater impact on both teacher retention and student outcomes.

Retention of new teachers who teach science or math is critically important given the difficulty of staffing those subject areas (Ingersoll & Perda, 2010). A survey of science and math teachers about their induction experiences found that induction programs that provided discipline-specific support made a difference in the success of the program (Luft & Cox, 1998). Further studies have demonstrated the importance of science-specific support for novice science teachers (Luft, Roehrig, & Patterson, 2003).

In this report, we provide data on science teacher retention from a recent survey of graduates of a science-specific induction program at the Exploratorium's Teacher Institute, as well as self-reported data on graduates' perceptions of how the program supported them as new science teachers.

Exploratorium Teacher Induction Program

The Teacher Institute (TI) was created by physicists at the Exploratorium at the request of local teachers who wanted to reproduce the learning experiences that take place on the museum floor in their classrooms. Since its inception in 1984, TI has utilized a staff of scientists and educators to help teachers by strengthening their science-content knowledge and providing access to classroom activities so that they can engage their students in inquiry-oriented experiences. Participants are invited to return for the rest of their careers, resulting in a growing community of over 3,000 teachers. By providing continual science-specific professional development delivered by a stable, experienced staff, TI has sought to provide teachers with support that complements and supplements what is provided by their schools and districts.

In 1998, in response to increasing numbers of novice teachers and their low retention rates, TI created two intentionally overlapping programs: the Teacher Induction Program (TIP), the nation's first science-specific beginning teacher program, and the Teacher Leadership Program (TLP). TIP provides participants with a menu of support options suited to the unique needs of novice science teachers from which an individualized program can be created. TLP leverages the expertise of TI's alumni pool and trains science teachers with at least five years of classroom teaching experience to serve as mentors and coaches for the novices.

Science teachers apply to the program in their first or second year of teaching in formal classrooms. Every year, twenty-five science teachers are accepted into the two-year program. Once accepted, teachers receive two years of classroom support through coach observations that occur twice a semester and monthly mentor meetings that happen outside of school time with a small group of novice teachers and two mentor classroom teachers. The novice teachers also participate in two Saturday, content-based workshops and two pedagogy workshops at the Exploratorium each semester, and a three-week Summer Institute that takes place after their first year of classroom-based support.

Methods

Survey Design

The first part of the survey asked TIP graduates about their professional status, whether or not they were currently teaching science in K–12 settings, the subjects, and the type of school in which they teach. Respondents who were not currently teaching in K–12 classrooms

were directed to a set of questions about their current profession and how long they had previously been in the classroom.

The bulk of the survey was designed to ask graduates to report on how often they felt they received support in the five critical areas identified in a recent review of the literature on beginning science teachers (Davis, Petish, & Smithey, 2006). These critical areas include: 1) an understanding of science content and the discipline of science, 2) science learners, 3) science instruction, 4) learning environment, and 5) professionalism. We briefly describe each of these critical areas below.

1. Science content and the discipline of science. Science as a discipline spans multiple areas of interest and study. If a science teacher has a science degree, he or she likely specialized in a particular science content area. However, science teachers need to have more of a generalist's understanding of science as they may be required to teach multiple areas.
2. Science learners. Science teachers need to have an understanding of how students' science understanding develops over time, as well as how students' prior knowledge and experiences are a resource for their learning. This understanding is critical to support teachers engaging all students in science learning.
3. Understanding instruction. This category relates to the science teachers' understanding of planning, instructional strategies, and assessment. New teachers have much more sophisticated understanding about instruction but struggle with how to enact it in the classroom.
4. Learning environment. Science teachers need to understand how to organize their classrooms for productive student learning. This relates to how teachers understand how to create a culture, atmosphere, and norms for science learning in the classroom.
5. Professionalism. As reflective practitioners, science teachers need to seek out relationships with parents, administrators, and other science teachers. Similarly, science teachers should continually attend professional learning opportunities and contribute to the maintenance and development of the science curriculum at their school and in the district.

The survey included 20 statements across each of the five categories described above. Each statement had six answer options including: always, often, sometimes, rarely, never, or not applicable. We posed four questions about teachers' opportunities for leadership in their schools and districts; answer options included yes, no, or not applicable. Table 1 describes the breakdown of number of prompts for each critical area of need.

Table 1
Number of prompts for each critical need area (as defined by Davis et al., 2006)

Area of Critical Need	Number of Survey Items
Science content	3
Student learners	5
Instructional planning	4
Learning environments	5
Professionalism	7

We included two open-ended questions: one at the end of the twenty-question section on how often they felt supported in the five critical areas. The question read:

> If you answered rarely or never to any of the questions above, would you have wanted to have more support in that area from the Teacher Institute? Please list those areas below.

This question was used to provide participants with the ability to respond with whether or not they needed TIP for those types of support. The last open-ended question asked respondents for any additional comments.

The complete survey was piloted with seven recent graduates of TIP. Think-aloud and post-survey interviews were conducted with each of the pilot participants. The survey was modified after pilot testing to change the types of responses for each statement from agree to temporal type responses. Questions were reformatted when think-aloud interviews revealed confusion because of the way a question was formatted.

Sample

Paper records, as well as a digital database, were mined for contact information for all the graduates of TIP. A total of 435 graduates were located in the system. We sent each graduate an e-mail with a link to the survey and a brief description of why we were conducting it. Of the 435 emails that were sent, a total of 70 bounced back as undelivered. We attempted to reach each of those graduates by phone and were able to locate current information for 20 of those individuals. Therefore, a total of 50 graduates of the program did not receive the survey due to a lack of contact information. We sent out a second e-mail to all the graduates that we had contact information for and who graduated from the program before 2015 (n = 385). A total of 143 graduates of the program completed the survey (response rate = 37%). Teachers were grouped into three-year cohorts based on the year they began the program, and respondents from each cohort were represented (see Table 2).

Table 2

Percentage of respondents from different cohorts of graduates (n = 143)

Year Started Program	Percentage of Respondents
1998-2000	13%
2001-2003	15%
2004-2006	22%
2007-2009	22%
2010-2013*	28%

**Note: There was no 2012 group. To keep each cohort to three program years, we added 2013.*

Analysis

Data was aggregated across different categories to create a picture of the distribution of teacher responses for each statement, which were then sorted by critical need. To calculate

retention rate, only respondents who graduated prior to 2010 were included (n = 103). Of the teachers who are not currently teaching in a K–12 setting, we calculated the number of teachers who reported teaching in a formal setting for at least five years.

Results

Graduates' Professional Status

Graduates of TIP teach a variety of science subjects, with the majority of teachers (56%) teaching more than one subject, for example 23% of respondents teach both biology and earth science. Most teachers teach either Biology (46%) or Physics (46%). Table 3 describes the subjects taught and the percentage of respondents for each subject.

Table 3
Percentage of teachers currently teaching by discipline (n = 101)

Subject	Percentage of Teachers
Biology	46%
Chemistry	33%
Earth Science	33%
Engineering	15%
Environmental science	17%
Physics	46%
Integrated/general science	11%
Math	10%

The majority of respondents teach at the high school level (50%) and in middle schools (39%) and most teach in public school settings (78%). Table 4 provides a breakdown of where graduates of TIP reported they are currently teaching.

Table 4
Percentage of respondents teaching at public, charter, or independent schools in 2015 (n = 99)

Where Do They Teach?	Percentage of Sample
Middle school public	31%
Middle school independent	4%
Middle school charter	4%
High school public	39%
High school independent	8%
High school charter	3%
Elementary school public	4%
Elementary school independent	1%
Elementary school charter	0%
Mixed grades public (K–8 or 6–12)	4%
Mixed grades independent (K–12 or 6–12)	2%

Retention

The majority of TIP graduates (73%) are still currently teaching in K–12 classrooms. The other TIP graduates work at the district or school administrative level (11%), are working in higher education (6%) and in informal education (2%). Three percent of respondents are not in any kind of educational position and 5% are currently on family leave or unemployed. Of the respondents that graduated from the program before 2010 (n = 103), 91% taught for at least five years in a formal K–12 setting. Table 5 provides the breakdown of current professions of TIP graduates.

Table 5
Current professions of TIP graduates (n = 143)

Profession	Percentage of Sample
K–12 classroom teacher	73%
School or district admin.	11%
Higher education	6%
Informal education	2%
Unemployed	5%
Non-education field	3%

Program

Of the areas of need identified (Davis et al., 2006), participants responded that they were always or often most supported in the areas of science content and professionalism. The distribution of responses varied for the categories of learning environments, students as science learners, and instructional practices. Appendix A provides the distribution of responses for each statement sorted by area of critical need.

More than 80% of the respondents chose always or often in response to questions about their accessibility to learning content and science activities through their participation with TIP. Similarly, more than 70% of respondents reported engagement with professional practices as supported by their work with the Teacher Institute. For example, 81% of respondents said that they have taken on leadership roles at their school, and 73% have mentored other science teachers in their school or district (Table 6). These two categories are critical components of TIP, and this is reflected in the response patterns in the survey.

Table 6
Professional activities of TIP graduates (n = 143)

Statement	Yes	No	N/A
I have taken on leadership roles at my school.	81%	18%	1%
I have mentored other science teachers at my school or district.	73%	27%	0%
I have led professional development at my school.	59%	41%	0%
I have led professional development in my district.	47%	52%	2%

For the other three areas of critical need, there is variation in participants' response patterns. When the statement was science-specific, respondents answered more in the always or often categories, but if the statements were more general and less science-specific the responses tended to swing more toward sometimes, rarely, and never. For example, in the category related to students as science learners, participants responded that they had more support thinking about students' science ideas and how to relate science to students' everyday experiences. In contrast, their responses to statements about monitoring or assessing student learning were sometimes, rarely, or never.

Only 65 of the respondents answered the open-ended question about whether or not they needed further support from TIP. Of those 65 respondents, 31 responded that they would have liked more support from TIP, particularly related to instructional planning and organizing their learning environment. Thirteen respondents thought it was more important that TI focus on supporting them with science content and activities rather than other areas of need, such as classroom management and communicating with parents. Another ten respondents suggested that while there was a need for those things, they received that support from other sources at work and was not something they required from TIP.

Discussion

To address the specific needs of novice science teachers, TI recognized that, in addition to the science content and inquiry activity support it provided experienced teachers, novice teachers needed access to veteran teachers who were still in the classroom and could provide ground-level support on basic teaching tasks. These include classroom management and lesson planning. TI believed that it was critical for this support to come from someone teaching the same subject, and drew from its pool of participants to create the Teacher Leadership Program to provide novices with science-specific mentoring and coaching. In this way, novice teachers were immediately embedded in a professional community of new and experienced teachers who all utilized the Exploratorium as their professional home. The participant's responses to the survey echo this intention and provide evidence that TI has been able to provide new teachers with content-specific support, as well as access to a community of professional science teachers. Furthermore, participants' responses suggest that TI has supported teachers in taking on leadership roles in their schools and district.

The success of teacher induction programs is related to both what is offered to new teachers, as well the comprehensive nature of the program (Ingersoll & Strong, 2011). Comprehensive induction that provides teachers with multiple supports has been shown to be the most effective at retaining teachers in their current schools (Ingersoll & Strong, 2011). The responses from TIP participants similarly suggest that they had a wide range of support, with TI providing science-specific support that they did not receive elsewhere. Future research into how TIP supplemented participants' other forms of support will help understand this finding. Results from this survey indicate that by structuring the program around science content and professionalism, TIP was able to support these critical areas of need for novice teachers. These types of support and others resulted in retention rates of TIP graduates in teaching and education that are significantly higher than the national average.

Implications

The results of this survey, as well as literature on the success of teacher induction programs, suggest that novice teachers need a comprehensive set of resources to support their retention and job satisfaction (Ingersoll & Strong, 2011). A handful of respondents to this survey argue that they did not need the more general teaching support, as other programs at their school and district provided that to them. Further research is needed to understand how these different programs came together to provide teachers with a comprehensive set of supports, and this research could inform more intentional partnerships between different programs to bolster teacher induction efforts.

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Appendix A

Percentage of participants' responses to each statement, sorted by critical area of need: C = content, I = Instructional, L = learners, LE = learning environment, & P = professionalism

	Statement	Always	Often	Sometimes	Rarely	Never	N/A
C	I learned science content that was personally interesting to me even when it did not pertain directly to what I was teaching that year.	73%	25%	2%	0%	0%	0%
C	I acquired activities that I could use in my classroom.	47%	41%	12%	0%	0%	0%
C	I learned science content that related to what I was teaching my students.	37%	55%	8%	0%	0%	0%
I	I used activities that I learned at the Exploratorium in my classroom with my students.	29%	40%	30%	1%	0%	0%
I	I received support in designing lessons, activities, or units that were aligned to standards.	24%	42%	23%	8%	1%	2%
I	I received assistance with planning units of instruction.	18%	39%	35%	6%	1%	1%
I	I was supported in sequencing activities within a unit of instruction.	16%	29%	37%	16%	1%	1%
L	TI staff helped me to understand the various ideas or preconceptions that students have about important big ideas in science.	44%	35%	18%	3%	0%	0%
L	I learned how to relate science content to my students' everyday experiences.	30%	48%	20%	1%	0%	0%
L	TI staff supported me in understanding how to modify lessons to attend to the various needs of my students.	27%	32%	32%	8%	0%	0%
L	I was supported in how to monitor student learning over the course of the unit.	16%	32%	36%	13%	2%	1%
L	I was supported in creating assessments to monitor student understanding in science.	9%	27%	38%	18%	6%	3%
LE	I learned how to organize my classroom to support hands-on science activities.	27%	41%	29%	3%	0%	0%
LE	I learned how to engage students who were easily distracted or off task.	16%	30%	41%	9%	4%	0%
LE	I learned how to effectively group students for productive group work.	10%	26%	33%	21%	8%	1%

LE	I was supported in how to have good communication with parents about students in my classes.	8%	13%	30%	31%	15%	3%
LE	I was provided help with managing paper work and grades.	6%	15%	40%	28%	9%	3%
P	I had access to a network or community of other like-minded science teachers.	80%	15%	3%	3%	0%	0%
P	I shared experiences that I had at the Exploratorium with other teachers at my school.	35%	49%	13%	1%	1%	1%
P	I reflected on my teaching practice to identify areas for improvement.	31%	41%	25%	1%	1%	0%