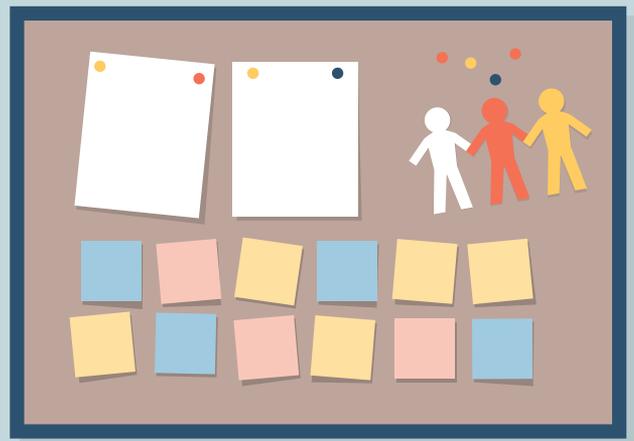
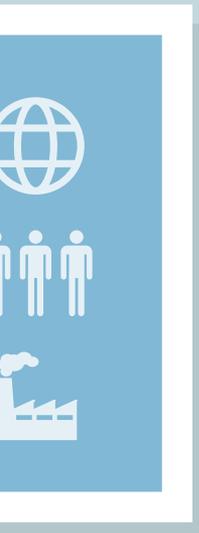




Reaching for



the Future

Building a professional trajectory

JULIE A. LUFT AND BROOKE A. WHITWORTH

Science teachers need to consider how they want to grow professionally. Thinking about one’s future involves identifying the knowledge, practices, and attributes needed in a new role. By using a framework such as the science education trajectory (SET), teachers can more easily consider their professional options and work strategically toward them.

The report on science teacher learning (NASEM 2015) emphasizes that teachers need strategic and coherent learning opportunities. Until there are defined pathways toward different positions, science teachers will need to organize their learning opportunities in such a way that they can learn intentionally and progressively. This is important to consider, as teachers do not typically have a prepared program of professional development opportunities tailored to their personal needs or professional goals (NASEM 2015).

Most professional development programs available to science teachers focus on improving instructional practice (Luft and Hewson 2014). This seems appropriate with the emergence of the *Next Generation Science Standards (NGSS)* (NGSS Lead States 2013), but these types of programs comprise only one area in the universe of potential professional opportunities.

Our goal is to help science teachers consider their professional options. We suggest a process to build a professional growth or learning plan, which we call a SET. A SET is specific to science education, and describes the knowledge, practices, and attributes a teacher needs to develop in order to progress to a new professional role (Luft et al. forthcoming). While this is not a classroom-based article, we hope to show teachers how they can grow professionally and benefit their students, their learning environment, and the science teaching profession.

How teachers learn

A professional trajectory is based on the idea that science teachers are always learning. Whether they are learning new ways to teach or gathering new information about a discipline, they are growing professionally. Mezirow (1978, 2012) offers a way to think about teacher learning, which he calls *transformative learning theory*. This view of learning recognizes that individuals have a specific frame of reference that is transformed as they gain more knowledge and experience (Mezirow 1978, 2012). The process of transformation is a result of reflection and discourse, which happens in a specific context and in concert with other individuals. For instance, as a science teacher reflects upon and discusses classroom instruction, the teacher becomes more empowered and autonomous as an instructor.

This view of teacher learning is important for two reasons. First, it reinforces the powerful nature of professional growth. Teachers are not only developing their knowledge and practices, they are also learning in order to influence the field of science education. They can become master teachers who support student learning, mentors to other teachers, or science coordinators who guide a district or a region. No matter how teachers learn and grow, they are taking on new positions that will have an impact on the field as a whole.

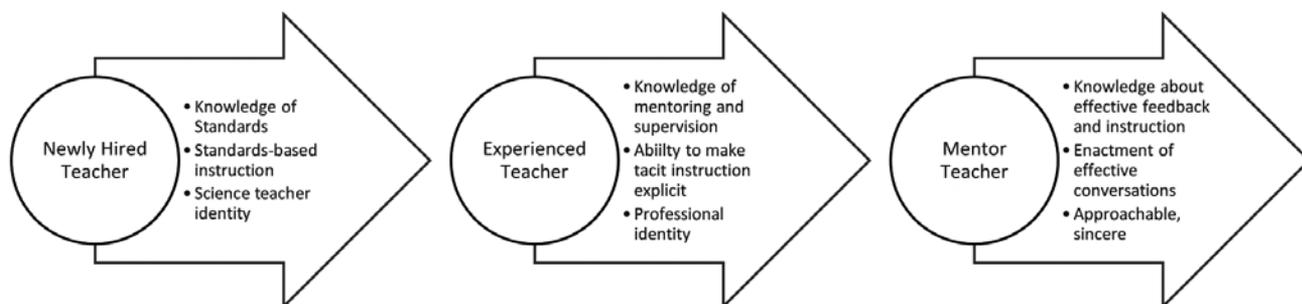
Second, this view of learning reinforces the importance of communities. Science teachers improve as they interact with their colleagues in different settings. The school setting provides one type of interaction, while conferences and professional learning opportunities provide others. In each of these settings, teachers construct their knowledge, practices, and attributes, and redefine their roles as science teachers.

Thinking about a trajectory

Unfortunately, the educational community has not helped teachers consider the different professional positions they can hold, or how they can grow into these positions. In fact, most discussion about improvement as a teacher pertains to instruc-

FIGURE 1

Possible science teacher trajectory for a mentor teacher.



tion or developing into a teacher leader or principal (Luft and Hewson 2014; Whitworth and Chiu 2015).

Teachers need to consider how they will transform over time, which can be done by thinking about trajectories. In a trajectory, there is an entry role and final role, with any number of intermediate roles. Figure 1 shows a possible trajectory for a new teacher who wants to be a mentor teacher.

This mentoring trajectory has three different roles, with each having distinct knowledge, practices, and attributes at each phase. The knowledge area pertains to the deep understandings that a teacher must have in each role. Practices are actions associated with attainment of the role. Attributes are the personal dispositions associated with the role. In this trajectory, not all of the knowledge, practices, and attributes are listed; those listed are informed by research on science teachers and mentor development (see Hawkey 1997; Hughes 2006).



Constructing your own science education trajectory

Table 1 is a SET template for helping teachers think about their personal trajectories. In filling this template out, there are a few steps to follow. First, a teacher should think about different aspirational professional roles. In our experience, this can often be the most difficult step. Many teachers have never considered their long-term career aspirations and are unaware of potential roles. Once an aspirational role is deter-

TABLE 1

SET template.

What would I like to do in my current position over time?

Is this a short-term or long-term role? Are there several roles or just one role?

What knowledge, practices, and attributes do you need to get there?

	Knowledge	Practices	Attributes
Current position			
Intermediate			
Aspirational			

What specific professional learning opportunities are needed in order to grow into this role?

TABLE 2

List of teacher roles.

TYPES OF ROLES	EXAMPLES
Private sector	instructional materials developer, curriculum developer, professional development program provider, consultant
K–12 school system	mentor, student teacher supervisor, curriculum developer, demonstration teacher, presenter or author, professional development leader, department head, science coordinator, learning community leader, master teacher, director, specialist
Informal education	instructional materials developer, docent, educational programmer
Higher education	professor/lecturer, research assistant, program provider, curriculum developer, inservice educator, professor of practice
Policy	educational policy maker, advisor to policy maker

mined, a teacher then needs to determine its associated knowledge, practices, and attributes.

Table 2 offers a list of different roles for teachers to consider. In science education, these roles can include: developing instructional materials, serving as a master teacher or department head, being a docent at a museum, conducting classroom-based research, or advising policy makers. Some of these positions may take place in educational settings outside of the classroom,

and most will entail additional professional development programming.

A simple way to identify an aspirational role is to ask the question, “What would I like to do in my current position in a few years or over time?” Some roles may be attainable in the short term, while others may take several years. There may also be some transition between roles over time.

Research may be required to understand exactly what a selected role involves. For instance, being a department head involves ordering materials, but it also involves providing guidance to the department, supervising colleagues, solving problems, advocating for science instruction, ensuring safe practices, and communicating effectively with colleagues and leaders (Peacock 2014). If a teacher is not familiar with all that a role entails, more research will be needed to understand the intermediate and final roles.

There are a few different ways to find this information. Studies can be downloaded from Google Scholar, ResearchGate, or other sources. NSTA affiliates will also have information about different roles. More importantly, these affiliates (e.g., NSELA, ASTE) are aware of the importance of science in these different roles. Some organizations are not discipline-focused and provide just general guidelines.

If little information is found regarding a particular role, it may help to speak with people already serving in the role. Asking questions about how they attained their position, the path they took, and what they view as the most important factors in the role are important. This will help determine the best intermediate positions and next steps within a SET.

With these resources in hand, it is time to start building a progression. Begin with the knowledge, practices, and attributes a teacher needs for the aspirational role. These are placed in the boxes of Table 1 associated with row titled Aspirational.





From the aspirational row, the teacher should use a backwards design approach. Rows can be added as needed if intermediate roles are required. It may help to talk this through with an administrator, colleagues, or other experts who may be familiar with the different roles. When the knowledge, practices, and attributes are determined at each level, they can be written in the associated boxes.

Finally, when Table 1 is completed, it is time to assess one's current place on the matrix. In taking stock of the knowledge, practices, and attributes that a teacher holds, discussions with administrators, colleagues, or family members may be useful. When a teacher determines areas for professional growth, specific professional development programs can be selected. Teachers will pursue professional learning experiences that contribute to the accomplishment of their goals, rather than select learning experiences that are simply enjoyable or convenient. The list of potential professional learning experiences should be written in the final box.

The time needed to work through this process depends on the aspirational role, the teacher's knowledge of this role, and the information available about it. In our experience, it can be completed in 60–90 minutes, but teachers need to have enough time to reflect and consider their goals. Coming together with colleagues, sharing their aspirational roles, then taking the necessary time to research the knowledge, skills, and attributes

needed to move forward is an appropriate next step in the process. The most important aspect of the process is encouraging teachers to think about what professional learning opportunities are going to support them getting from point A to point B, and then returning to this process periodically to assess and reflect on their current position and potential next steps.

The potential of SETs

SETs are important to educators for several reasons. By exploring different goals such as improving effectiveness with students, mentoring teachers formally or informally, guiding their department as a department head or chair, or aspiring to be a district science coordinator, the SET allows teachers to configure their professional development trajectories. These sequences can result in transformative learning opportunities that are purposeful and empowering (Mezirow 2012). More importantly, teachers can purposefully challenge themselves to grow as much as they challenge their students. ■

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