

# Insights Into Teacher Reflective Practice During Planning

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**Abstract:** This study was designed to get an insight into the reflective nature of teacher planning. Specifically, we looked at what external and internal resources do teachers draw on in their reflections during the action of planning. Two cases of experienced urban high school chemistry teachers planning instruction for a similar set of chemistry topics were used in this study. The types of data used in this study included think-alouds, interviews, classroom observations, and artifact collection. The findings analysis of the two cases that both teachers used a variety of external and internal resources during their planning. The teachers' use of resources was associated with indications of reflection. The type of resources that a teacher used influenced the type of reflection the teacher would make. In order for reflection to occur, the resource had to have meaning to the teacher.

## Introduction and Theoretical Background

Professionals of all types, including teachers, are in positions in which their prior experiences form the basis of their management of particular problems that they confront in their practice. Building on the work of Dewey (1933) and Schön (1983), a critical component of the way in which professionals respond when presented with new situations is the act of reflection. Schön (1983) argued that professional could benefit from and improve their practice by reflecting. However, Marcos and Tillema (2006) cautioned that research that analyzes teacher reflective thought out of context would reveal only part of the story. Thus, research should make a connection between reflection and specific actions of teacher practice. Research studies on teacher reflection typically focus on teachers' change in beliefs, personal identity, attitudes towards teaching, and self-efficacy (Marcos, Sanchez, & Tillema, 2011). These studies look at the internal mental dynamics of the teacher, but often stop short of linking those internal characteristics to the external actions of creating and executing a lesson plan; in other words, the actions that result from teacher reflection.

Teacher planning is one action of teacher practice that researchers can examine to better understand teacher reflection in action. Currently, teacher cognitive research has predominantly examined teacher thought processes before instruction (planning), during instruction, and after instruction (reflection) in an effort to understand the decisions teachers make and the cognitive processes they employ (Hall & Smith, 2006). Also, type of research occurs in distinct phases and not as a holistic process. Although studies examining reflection have appeared periodically, more recently it has become a growing area of inquiry (Ethell & McMeniman, 2000). While few studies try and link planning with instruction, little research has been conducted examining planning, instruction, and reflection as a holistic process (Hall & Smith, 2006). There is purpose in describing in depth the reflection that occurs during the action of teacher planning. Reflective teaching practice is viewed as an important component to enhance the development of effective teachers (Dallas, Reed, & Graves, 2010; Schön, 1983; van Manen, 1995). Currently, the literature does not include a way to document reflection during planning. Without any evidence of what teacher reflection looks like during a specific action of his or her practice, teachers are still told they need to be reflecting during his or her practice, and are even trained to do so by researchers and educators (Craig, 2010).

Teacher instructional planning is about selection and use of resources. Researchers need to evaluate the way in which science teachers use specific curriculum materials to improve instruction. Choosing curriculum content is one of the most complex planning tasks faced by teachers (Ball & Cohen, 1996). If there is a specified curriculum, teachers do not need to spend large amounts of time deciding which content they will be teaching next or how the curriculum aligns with standards (Duschl, Schweingruber, & Shouse, 2007; NRC, 1996). On the other hand, teachers do need to plan for instruction while using reform curricula in order to select appropriate resources. Reform curricula provide multiple resources to aid planning, such as pacing guides, coaching, model lessons, and teaching summaries. Thus, researchers should ascertain which resources teachers use during planning and which they do not. Therefore, in order to fully describe reflection during planning the types of resources a teachers uses as well as how teachers use these resources to promote reflection needs to be examined. This examination provides an opportunity to explain what resources afford or constrain a teacher's opportunity to reflection during planning.

In addition, experienced teachers can offer important insights about teacher reflection. A primary goal of many teacher education programs is to develop reflective teachers (Dallas, Reed, & Graves, 2010). The current study can offer insight into the types of reflection employed by experienced teachers and provide cases to consider for those in teacher preparation programs. Thus, it is important to characterize reflection during specific components of teacher practice.

For this study, the High School's Transformation (HST) initiative provided an opportunity to study the reflective practices of two science teachers in an urban high school context with ongoing reform and a specified curriculum. The specific reform used for the study was Inquiry to Build Content—An Instructional Development System (IDS). The IDS provided a community of teacher an opportunity to build science content, concepts, and skill development around the instruction approach of guided inquiry.

In this paper, we discuss a research study designed to examine case studies on the ways in which reflection can support the careful planning that is an essential part of good teacher practice (Carlo, Hinkhouse, & Isbell, 2010; van Manen, 1995). Specifically, we answer the question of what types of reflections are associated with planning in relation to the kinds resources a teacher draws on during his or her reflections. This study looked at two cases of experience high school chemistry teachers planning instruction for a similar set of chemistry topics. Providing explanations of what reflection and resource use actually looks like during teacher planning will offer educators and researchers a chance to understand reflection during planning. With this knowledge researchers can train teachers in how to develop a better reflective practice while engaged in teacher planning during professional development. Also, curriculum developers can get a better insight into how teachers use curriculum materials for the purpose of planning.

## Method

The goal of this research was to describe and analyze teacher reflective practices during the instructional planning of chemistry teachers and the materials or experiences teachers used to support the reflections. To achieve this goal a qualitative multiple-case study approach was used. A case study was appropriate for this research because little is known about reflection during planning for instruction and the relationship between the boundaries and phenomenon are not evident. Two cases comprised the current study, defined as experienced urban high school chemistry teachers planning instruction for a similar set of chemistry topics.

## Study Context

Two high schools participating in the IDS reform project in a large Midwest urban school district functioned as the study sites. The criteria for selecting teachers to participate in the study were their experience level in teaching, their level of participation with the curriculum, and plan for instruction on a regular basis. The two participants were urban high school chemistry teachers. The pseudonyms selected for the two teachers were Janice and Christina. The two teachers participated during the Fall 2010 semester.

The two teachers that participated in this study derived from a sample of ten teachers. Both teachers had four years of experience in working with the IDS curriculum and were committed to the IDS program. At the beginning of the school year, both teachers indicated they would be actively implementing the IDS curriculum in their classrooms and working to gain ownership in the curriculum. However, when the study was about to start Christina decided that she would be using parts of the IDS curriculum in her classroom as well as the curriculum she used prior to participating in the IDS. Both teachers taught very similar units covering almost identical chemistry content.

## Data Sources

Data for this research was collected during six weeks of teacher instruction. The first data source consisted of teacher lesson plan think-alouds. Since experienced teachers are more likely to engage in mental planning instead of writing more formal lesson plans, the teachers were asked to participate in think-alouds during the act of planning. Both teachers were given Livescribe Pulse Smartpen® to complete the think-aloud planning session tasks. Livescribe® developed an application that records both audio and writing during the same moment in time. This tool allowed to the researcher to capture reflective thought during the action of planning. Both teachers planned 9-10 lesson in the Livescribe notebooks provided to them. The second data source was artifact collection. At the end of the study, each of the teachers' Livescribe notebooks, formal lesson plans, and worksheets were collected. The last data source consisted of three interviews with teachers conducted after 3-4 lesson planning sessions. The purpose of the interviews was to obtain descriptive information about teacher planning and to gain a better understanding of teacher reflections and resource use during the planning process.

Data analysis consisted of analyzing transcribed think-aloud and interview sessions for both teachers. Codes were generated around two essential categories, the types of resources used by the teachers and types of reflections. Teacher reflective statements were coded based on three types of reflections defined in the literature. The first included reflection-in-action defined by Schön (1983) as a process involving thought during action. The second type of reflection included reflection-on-action, as defined by Schön (1983) as a process that involves action then thought. The last type of reflection included reflection-for-action defined by Killion & Todnem (1991) as a process that involves thought then action. Cases for each teacher were then developed to describe teacher resource use and reflection. Lastly, a cross case analysis completed by analyzing similarities and differences between the two cases by exploring themes and categories that emerged form the analysis of the two cases.

## Data Analysis and Findings

### Resource Use

During the coding process, it became evident that the types of resources the teachers used came from different sources. A resource was defined as a tool or other thing a teacher can use to reflect or use in his or her planning process. Two themes emerged from the coding of both teachers' data in regards to the types of resources used during reflection. The first category was external resources. These were resources provided to the teacher by the IDS or supplement resources the teachers acquired. The second theme included internalized resources. These resources once external to the teacher were internalized through the teachers' understanding and prior experiences. Table 1 displays the types of resources both teachers used during planning.

The external resources Janice used during her planning were mainly comprised of the materials provided to her by the IDS, such as, model lessons, the science writing heuristic, pacing guides, assessments, worksheets, and the textbook. In comparison, Christina did not use any of the IDS materials provided to her, since she did not implement the IDS curriculum to its full extent. She used outside external resources from other curricula as well as the Internet during her planning. The internalized resources the teachers used included their knowledge of their students, their pedagogical content knowledge (PCK), and skills and dispositions. An example of each internalized resources is provided below.

Table 1: Themes for resources used by Janice and Christina

Janice's Resources	Christina's Resources
<b>External</b>	
Science Writing Heuristic (SWH)	Textbooks
Model Lesson	Worksheets
Assessments	Internet
Pacing Guides	ACT Standards
Textbooks	Lab Activities
Worksheets	Assessments
Professional Learning Community	
<b>Internalized</b>	
Knowledge of Students	Knowledge of Students
Pedagogical Content Knowledge (PCK)	Pedagogical Content Knowledge (PCK)
Skills and Dispositions	

Throughout the course of the study both teachers utilized their knowledge of their students. Janice and Christina made sense of what they believed their students could and could not accomplish in their classrooms. Both teachers continually were building upon their knowledge of their students. Examples included their knowledge about their students': motivation, math skills, writing skills, listening skills, transferring knowledge, working in groups, and ability to think independently. One example that demonstrated the use of knowledge of students was when Christina was planning a lesson on periodic trends. She stated,

Overall my students did a decent job on the worksheet. One problem I noticed is that they are still having a hard time reasoning with data. A skill I have been working on with them since the first week of the semester. They still struggle with it. The one question that asked them to predict the electronegativity of Iodine given the electronegativity of three other elements in the same family seems like they drew a blank. If it is not something I have told them specifically how to do, they don't even try to make sense out of what the problem is asking. Instead they leave it blank or write some random answer down. No motivation.

Here, Christina drew on the resource of her knowledge of her students in order to explain why her students had a difficult time answering one of the questions on the worksheet. Christina connects this to her students' lack of motivation.

The second internalized resource both teachers used during planning was their PCK. PCK refers to how teachers' use both pedagogical knowledge and content knowledge in forming ways of knowing about how

to teach the content to their students. In regards to planning, a teacher's PCK may contribute to their understanding of what to plan for, why they are planning this lesson, and how to plan for the lesson. For the purpose of this study, experiences are knowledge gained from what one has observed, encountered, and undergone in the past. A strong link existed between both teachers' content knowledge and pedagogical approaches they used in their classroom. An example of PCK as an internalized resource was when Janice was planning a lesson on accounting for atoms. One of Janice's pedagogical decisions was to ask students to represent a chemical reaction in various ways as a bell-ringer. These representations include using symbols, words, and at the particulate view. She stated:

I know from my own knowledge that understanding what a chemical reaction represents can be tricky at first. Before I first stated this curriculum I rarely looked at chemistry at the particulate level of representations. I was never taught that. I only learned it the symbolic way and to write it in a sentence. So that is why I need to express them [the representations] independently first to my students as a bell-ringer. I want to clarify the confusion they have right away, just because the particulate was new to me when I first started, and they will need time with the material just like I had to take time, even though I understood it right away.

When Janice used her PCK as a resource, she used it to discuss her own experience in learning the material for the first time. This allowed her to connect to the experience she had when she first learned particulate representations in working with the IDS curriculum. She then connected these two experiences to the experiences her students might have when she teaches the material. She developed a deeper understanding of her own chemistry knowledge and related to this to her students' learning.

The last type of internalized resource was the teacher's skills and dispositions. Janice was the only one who used this as a resource during her planning. Skills include a learned capacity to solve novel problems. Janice drew on the specific skills of communication, organization, classroom management, and seeking feedback. Dispositions were defined as the tendency to act in a certain manner under a given circumstance in order to create change. Janice's dispositions included motivation, curiosity, creativity, patience, open-mindedness, and self-awareness. One example of Janice using her skills as a resource was when she was planning a lesson on a lab activity called metal or nonmetal. She states:

It is nice to have students move around the room and work with each other, gives them another type of learning experience, one I think is so important, however, it can get out of control, and really fast. I have to manage my students accordingly in order for learning to occur in my classes. As my goal is to provide students with the best learning opportunity and I have to manage my classroom for this to happen. I know this too well. Therefore, I will make sure the groups the students working together are ones in which little disturbance should occur.

In this example, Janice first talks about the benefits of having her students work together in groups, which represents her skill of classroom management. This learning experience for Janice's students is important for her. On the other hand, group work can lead to a disruptive learning environment. In this instance when Janice identifies a problem that she draws on her skill of classroom management as a resource to reflect on how to provide an environment in her classroom that is conducive for learning. An explanation of the relationship between the types of resources used and the reflection types are discussed in the next section.

### Teacher Reflection

The type of resource that a teacher used influenced the type of reflection the teacher would make. Since teachers reflected for the specific action of planning, reflection-for-action was the most common type of reflection. All resources, external and internalized, were a basis for reflection-for-action. An example of a reflection-for-action statement by Janice is when she is making a decision to use the Science Writing Heuristic (SWH) (external resource) as part of her pedagogy for an inquiry based activity. Janice stated, "The reason why I want to use the SWH is because I want to see what they [students] are thinking and to make sure they are making sense of what they just did." In this statement Janice reflects on the SWH to justify why she wants to add it into her lesson plan. She is reflecting-for-action here. This type of reflection allowed her to move forward in her planning because she gained an understanding of what the resources afforded her in her planning process.

A second example of a reflection-for-action statement made by Christina was when she referenced the use of the textbook for another pedagogical activity on molar mass. She stated, "Students will answer textbook problems 1 through 9 on page 163 of their textbook. There are a variety of compounds in these problems. Some basic and some more complex. Students will turn these into me to be graded." When she drew on the worksheet as a resource, she illustrated what students would accomplish as well as what the concepts the

worksheet covered. She was reflecting-for-action; in regards to the pedagogical moves she planned on taking.

Not all resources types were directly related to reflection-for-action. Some resources that teachers drew on did not immediately allow them to reflect-for-action such as internalized resources. Both teachers would draw on an internalized resource to reflect-on-action. This reflection allowed the teachers to relate their understanding of the resources to their current action of planning. Following this reflection they would then reflect-for-action. For example, Janice reflects-on-action in regards to her understanding of her PCK (internalized resource), while planning a lesson that involves introducing the mole concept. She states,

Now that I am introducing a new term associated with the periodic table, I am going to make sure I review the other numbers on the periodic table with my students again. Last year I did this and my students did not get confused about which number meant what on the periodic table like my class did during the first year of teaching this. From the first year teaching atomic mass, my students kept forgetting which number was which on the periodic table. That is why I need to add something to this lesson. Since it worked last year, I am going to do it again this time around.

In this statement, Janice drew on her PCK as a resource by reflecting on two different prior experiences. The first was about a pedagogical decision she made in teaching the lesson the previous year. When she drew on this resource, she was reflecting-for-action and reflecting-on-action. Janice needed to support her pedagogical decision, the action, because she wanted to assure it was the best approach for her students to learn the material. Janice was building on her pedagogical knowledge. Janice noted a second prior experience when she taught atomic mass during the first year working with IDS. This was Janice reflecting-on-action. She identified a problem three years ago when she first taught the lesson when students had confusion about the meaning of the numbers on the periodic table. Janice had a better understanding of how to introduce the term mole to her students because she could connect prior experiences to her current experience.

Reflection-in-action occurred when the teachers encountered a problem. This allowed both teachers to then draw on an external resource. For example, when Christina was planning a lesson on oxidation-reduction she stated,

I am stuck trying to think about a good lesson to use. I do not like teaching this content. The activities and techniques I have used before just don't seem to work. I found an activity online that I am going to try out. I am going to add this into my lesson plan and see if it works with my students this year.

In this instance Christina encountered a problem and reflects-in-action. The problem she identified is to find a new approach to teach oxidation-reduction. She uses the Internet (external resource) to find a new pedagogical approach. This then allows her to reflect-in-action by continuing on with her planning process. This reflective action seemed to drive resource use by the teachers and help them in understanding something that happened in the past. Overall, the resources used by the teachers were specific to what the teacher thought they needed to accomplish and also had meaning to the teacher. The type of resources that the teachers used influenced the type of reflection the teacher would make.

## Conclusion

The type of resources that a teacher used influenced the type of reflection the teacher would make. Not all resource types were directly related to reflection-for-action. This means that there are specific resources that teachers drew on that did not immediately allow them to reflect-for-action. These resources include internalized resources. Both teachers would draw on an internalized resource to reflect-on-action first. Following this reflection they would then reflect-for-action. External resources were always associated with teacher reflection-for-action.

Both teachers had different conceptions of what resources they needed during planning. What this means is that the teachers did not rely on the same resources during planning. The way the teachers structured their model of planning influenced their resource choices. If the teachers structured her model around her own understanding of her own practice, she was more likely to draw on internalized resources like her PCK and her skills and dispositions. However, if a teacher structures her model of planning around only her students, she would be less likely to draw on internalized resources. What was important here was that it was critical for teachers to have good resource choices available to them. Resources matter in the reflective planning process. Even resources one might think are not important to teachers' planning processes might actually be important to the teacher. Resources function differently for each teacher. When developing resources for teachers to use for planning, it is important to not limit or constrain how a teacher should use that resource. A teacher may see a benefit in using that resource that was different from the way in which it was intentionally designed. Every

resource could have potential value to a teacher, so it is crucial that resources are not labeled as “good” or “bad.”

However, what is essential is that the resource has meaning to the teacher. Teachers need to understand the affordances of the resources in order for reflection during planning to occur. Teachers make meaningful decisions to use resources during their planning processes. There is a reason why a teacher draws on a specific resource during a particular time in his or her planning process, and that is to meet these goals and intentions. In order to do this, teachers must reflect accordingly by drawing upon a specific resource they know will help them move forward.

## Implications for Research and Instruction

Our work presents a first attempt to understand the teacher reflective practice during the act of instructional planning. Currently there is no method that has been designed to really see reflection-in-action in teacher practice. This methodology provided an opportunity to capture these two teachers’ reflective planning processes. By using this approach I was also able to document what the teachers were thinking during a given point in time of their planning. There was no wait time needed. This methodology also allowed the teachers to plan for their lessons anywhere and anytime they wanted to. They were not restricted by any means to plan for their lessons with me there with them. This process allowed for teachers to plan in their naturalistic settings, whether it was at school, at home, or on the train. There was also no restriction on the teachers to have to plan a lesson during one sitting. The teachers could plan for a lesson over a period of multiple days if they chose to.

In order to get a better understanding of teacher practice, it is important to look at teacher practice in authentic detail. What this means is that we will be able to capture the true nature of a teachers practice. This is important because we do not know what this looks like well enough. In order to accomplish this task, we need to continue to develop methodologies that do not restrain a teacher while they are engaged in a particular component of their teacher practice. This will allow teachers to make connections between different components of their practice, as well as the freedom to draw on resources that they find valid.

By looking at teacher practice researchers will get a broader view of what this practice actually looks like. We will see the uniqueness and complexity within a teacher’s practice. Also, we will get a better understanding of what is important to the teacher, and how this allows the teacher to bring in their expertise. This study has shown that it is important to value a teacher’s expertise, PCK, and their knowledge of students. The teachers in this study relied heavily on understanding their prior experiences to plan for their lessons. These teachers are continually building upon their knowledge and understanding of their practice and their students on a daily basis. Both teachers had similar and different aspects to their expertise, PCK, and knowledge of their students that they would draw on as resources during their planning process. It is important to value a teacher’s expertise and their knowledge of their practice and students because this is essential to reflection and decision making in planning. This also affects the resource choices made by the teachers.

Specifically to science reform, research that focuses on science reform does not always take into account a teachers’ expertise (White & Frederiksen, 1998; Collopy, 2003; Forbes & Davis, 2010). This especially occurs when reform projects develop curriculum materials for teachers. Teachers in science reform participate in professional development that tells them, for example, how to teach a particular lesson, how to use new curriculum materials, and how to plan for a lesson. Reform science tries to change teachers’ practice. This study shows how important it is for curriculum and PD planners to take into account a teachers’ expertise, especially in planning, when designing a science reform curriculum. Also, science reform needs to develop materials with a notion that teachers might not use them for the intended purpose they were developed for. Science reform may need to look at the content expectations instead of practices.

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