Understanding How Educators Make Sense of Content Standards

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Abstract The purpose of this paper is to put forward a new conceptual framework that depicts how educators make sense of content standards and the changes that content standards engender. The Sensemaking of Content Standards (SoCS) Framework brings together different models that have been used in the literature to understand how content standards are framed by sensegivers, filtered through sensemaking processes, and implemented in classrooms. We begin by offering a rationale for the need for such a framework. Following, we build the framework by introducing each of its major research-based components. Finally, we test the framework by applying it to the cases of two state-level science education leaders in the United States reflecting on the changes that new K-12 science standards will bring to classrooms and their concerns about resistance to change.

Keywords: academic standards, change, Common Core, content standards, NGSS, science standards, sensemaking, sense-making, standards


1. Introduction

Arguably, the most ubiquitous documents affecting K-12 classrooms are content standards, sometimes referred to as learning standards or academic standards. Consequently, a tremendous amount of research has focused on topics such as the relationship between student achievement and standards-based curriculum [1], dispositions toward content standards [2], and alignment of assessments to content standards [3]. Yet, the processes by which standards are translated from written documents to classroom change is far from clear-cut. It is generally known from multiple studies that content standards are frequently adopted in limited ways or are substantially modified [4]. Yet, researchers have struggled to develop a cohesive understanding of the pathways by which standards are interpreted [5].

Broadly, research related to content standards has resulted in two general approaches. One strand of research has focused on the structures and policies that support and justify content standards. Elements comprising this strand are referred to as primary drivers. Primary drivers include what the National Research Council (NRC) [6] referred to as channels of influence, such as curriculum and professional learning. Additionally, primary drivers include formal and informal policies that impel how content standards are to be addressed.

In another strand, researchers have leveraged tenets of organizational theory to understand teacher and administrator sensemaking processes regarding standards. Often rooted in Weick’s treatise, Sensemaking in Organizations [7], sensemaking research addresses how educators resolve disconnects between personal beliefs and messages about change, and asserts that sensemaking is motivated by a need to resolve ambiguity and uncertainty [8]. Sensemaking involves personal and active processes that draw on an individual’s experiences and values as moderators [9,10]. Sensemaking therefore can involve group negotiation as educators co-construct meaning from messages about change [12]. Further, messages are often strategically communicated, or framed, for delivery from one agent to another. This messaging is sometimes referred to as sensegiving or reason giving and it embodies rationales that drive interpretation and action [13].

Both of these approaches, primary drivers and sensemaking, provide valuable insights regarding the processes by which content standards are translated into classroom practice. To fully understand these processes, we contend there is a need to incorporate both approaches into one framework. Such a framework allows for an analysis of the relative effects of primary drivers in addition to an understanding of the sensemaking that happens within an educational community when content standards and related policies encourage change. Fundamentally, such a framework allows us to understand the processes affecting educators, situated in communities, addressing the question how will I respond to these content standards?
The purpose of this paper is to pose a new research-based conceptual framework to help understand how educators are affected by external, personal, and normative influences as they consider and respond to content standards. In the first portion of this paper, the construction and dynamics of a new framework, titled the Sensemaking of Content Standards (SoCS) Framework, is explained. Following, use of the SoCS Framework is illustrated by applying it to cases wherein two state educational agency personnel consider what affected their thinking and actions related to development and enactment of new state science standards.

2. The Framework

2.1. Primary Drivers

Our description of the SoCS Framework begins with two kinds of drivers that can sway how standards are interpreted and enacted: channels of influence and policy levers.

2.1.1. Channels of Influence

The first component of the SoCS Framework (Figure 1) focuses on the conduits through which content standards typically travel. The NRC [6] developed a useful model that highlights the importance of what they referred to as channels of influence. The Committee delineated three channels of influence: (1) curriculum, (2) professional learning, and (3) assessment and accountability. The NRC model is a useful beginning point because it acknowledges that educators often interpret cues for standards-based change through means other than standards themselves.

Incorporating two decades of additional research, the SoCS Framework takes up the NRC model with three adaptations. First, the NRC model bundled accountability and assessment as a single channel, whereas the SoCS Framework examines assessment as a unique channel of influence and addresses the effects of accountability when considering policy levers which are discussed in the following section. Although high-stakes assessments are among the tools of accountability, separating assessment from accountability allows us to distinctly examine the effects of assessments from the policies often tied to test results. Another reason for separately examining assessment and accountability is that accountability formulas often include factors beyond typical assessment, such as attendance, graduation rate, and teacher qualifications [14].

The SoCS Framework also builds on the NRC Committee’s model by adding two channels: standards documents and research. The standards documents channel encompasses actual content standards, typically delineated by grade level, plus supporting documentation such as summaries, crosswalk documents, official rationales, and frameworks. Thanks to technology-enabled access to searchable standards, educators interact easily with standards documents and time spent reading these documents influences understanding [15]. Like any of the channels, the research channel may not always be triggered. Yet, the research channel is an important part of the SoCS Framework because there is evidence that reading and applying evidence-based research directly impacts beliefs and practices [16].

2.1.2. Policy Levers

Senior personnel and external entities often convey messages regarding standards through policy [17,18]. These policy levers are characterized as mandates, recommendations, and inducements. These mechanisms are not mutually exclusive to one another and exist in a fluid state whereby perceptions of each can vary between sensegiver and sensemaker. That is to say, what one person interprets as a mandate, another may construe as a recommendation. Policy levers quite often overlap with channels of influence. However, they are retained as distinct aspects of the SoCS Framework because they each offer a different conceptual tool for understanding the influence of each on sensemaking. For example, an adopted curriculum, examined as a channel of influence, may reveal the ways in which teachers extract meaning regarding standards from a textbook. Whereas when curriculum is examined as a policy lever, it may reveal ways in which feelings of coercion creates resistance to change among teachers.

Mandates can be large-scale, such as a state requirement to administer high-stakes standards-based assessments, or be dispensed locally, such as a principal requiring daily silent reading to meet language arts objectives or districts reducing arts education to provide more time for tested subjects. In contrast, recommendations are endorsements for particular actions, such as suggesting elementary teachers devote x amount of weekly minutes to science instruction. Although mandates and recommendations have defined differences, teachers and administrators may interpret them in ways that blur boundaries. For example, an administrator’s recommendation to have high school students attempt university credit exams, can be inferred as a requirement by some teachers [19]. Likewise, teachers may interpret policy “requirements” as recommendations or even ignore mandates altogether when they sense it is safe to do so, feel the policy does not align with personal convictions, believe the policy will soon be replaced by another du jour recommendation, or observe that most colleagues are ignoring the mandate [20].

Inducements are often attached to a mandate or recommendation and can play a key role in teacher sensemaking. Within the SoCS Framework, inducements include monetary as well as non-monetary penalties and incentives. Monetary compensation related to content standards can arrive in different forms, such as performance pay for meeting student objectives or a stipend for participating in professional development. Non-monetary inducements include public display of poor student assessment scores and recognition as being a high performing school [21,22]. Although a reward climate can positively impact how a person feels about their organization [23], inducements can negatively impact teacher morale and the changes they are willing to implement if an inducement is seen as unfair or burdensome [24].
2.2. Sensemaking Processes and Domains

The SoCS depicts two sets of primary drivers (channels of influence and policy levers), and those drivers are often framed for delivery by sensegivers who attempt to rationalize why others should pay attention, or not pay attention, to content standards. Communities and individuals then make sense of those drivers and framing rationales and resolve how they will respond. These sensegiving and sensemaking processes, occurring in the domains of communities and individuals, are addressed in this section. It is noted, despite the concentric depiction of the SoCS Framework (Figure 1), it is emphasized that primary drivers do not necessarily follow a linear path and may engage with none or any of the sensemaking processes and domains described.

2.2.1. Framing Rationales

As an aspect of sensegiving, framing attempts to focus sensemakers on an agenda that includes goals, needs for reform, and prescription for action [5]. Broadly, framing is the process of developing a point of view about an issue [25]. It is contended that the rationales used in the framing process play a role in how educators receive and interpret messages regarding standards. Framing rationales are defined within the SoCS Framework as justifications for change and are provided by sensegivers at all levels of educational organizations (this is why I want others to do this) and perceived by sensemakers (this is why others want me to do this).

Framing rationales may or may not invoke one or more of the drivers. For example, a school principal might tell teachers they need to adopt a new math curriculum because it simply is the district requirement (implicating a mandate driver) while another school administrator additionally invokes the framing rationale that the new math program will help students learn (no driver is implicated). Understanding the use and import of framing rationales is critical because “framing of policies shapes how policies are ultimately enacted” [13].

Weber’s descriptions of social action [26], are useful for describing framing rationale types. The four types are characterized as goal-oriented, value-oriented, affective, and traditional. Goal-oriented emphasizes that specific actions will lead to a defined end. For example, arguing that adopting new content-based curriculum will be an effective way to help students do well on end-of-year exams is goal-oriented rationality.

Value-oriented rationale centers on intrinsic reasons. Cases of pure value-oriented rationale, sans consideration of end-goals, are rare and it is often difficult to distinguish goal- and value-oriented rationality [27]. However, rationality is characterized as value-oriented when it centers on inherent worth gained from engaging in the activity at hand. For example, value-oriented rationality undergirds a teacher creating democratic decision-making
in their classroom because they believe it is the right thing to do.

Affective rationality is emotional and manifests as unrestrained reaction or emotional tension. This figures into sensegiver rationales when a sensegiver is attempting to provoke emotion as a means to elicit change. For example, a calm and goal-oriented discussion of student achievement may engender different kinds of responses than an emotional plea towards saving the school from accountability-based repercussions. Finally, traditional rationality is based on ingrained habitation and conventions. For instance, districts adopting new textbooks every seven years because that is the customary practice is an example of traditional rationality.

2.2.2. Community/Organizational Attributes

Sensemaking is situated in a sociocultural context, and social interactions are frequently part of the sensemaking process [11,28]. This is certainly the case in education, wherein educators make sense of standards in ways often facilitated through professional norms or informal collaboration with colleagues. Because of its social nature, aspects of the community or organization within which educators work can affect how they make sense of standards and the changes that are brought about. To tease out the aspects that guide sensemaking in an organizational context, we use the distinctions of structure, culture, and agency.

Structure. Policymakers and educators are constrained by the structures and institutional rules of schooling that shape how decisions are made, who makes them, and the available options for response [29,30]. Such structures can include channels of influence discussed above, such as district adopted curriculum. Other structures consist of policies and routines at the district and site level. For example, the ways in which collaboration time is structured can facilitate or hamper translation of standards into practice [31]. Material resources are another aspect of organizational structures that can affect sensemaking and change. Educators are aware of the ways in which resources support or impede their ability to implement standards [32]. For example, a teacher may be concerned about whether she has the materials to teach a particular science standard.

Culture. Likewise, the cultural environment in which sensemaking occurs can influence processes by which educators take up and transform ideas. Educators’ memberships in various ideological communities provide distinct worldviews that flavor interpretation of new information [11]. Likewise, the institutional nature of schooling can shape meaning-making around standards and practice [30]. For example, teachers may be unable to conceptualize schooling without grading because grading has been incorporated as an unquestioned legitimized practice. At the site level, teachers draw on community norms regarding teaching and other aspects of schooling as they determine how to address standards [11,33]. For instance, teachers that engage in frequent and thoughtful discussions with colleagues regarding standards tend to change their practice on a deeper level [34], whereas a focus on privacy within the classroom more likely results in fragmented change [35].

Agency. Agency is the “socioculturally mediated capacity to act” [36]. Within the visible and invisible guidelines provided by structure and culture, educators exhibit differing degrees of agency as they engage in sensemaking and sensegiving. They actively frame and adapt standards to their contexts and prior beliefs, and collectively shape meaning-making regarding standards. Organizations afford administrators agency to affect channels of influence, policy levers, and rationales [37]. The agency educators have can also be greatly affected by organizational characteristics and leadership structures [38]. Teachers are unlikely to internalize the principles that underlie standards, nor commit to associated change, without some agency in regards to learning and implementation [39,40].

2.2.3. Individual Attributes

People sift through their understanding of the world, their personal principles, and their intersectional identity to determine how they will respond, or not respond, to catalysts. The processes of sifting, deciphering, and responding embody sensemaking. Sensemaking, by definition, occurs in the context of a community, but each actor possesses traits and experiences affecting their own meaning-making: experience, knowledge, beliefs, values, and identity.

Experience and Knowledge. When content standards suggest change, it is natural for educators to compare those changes to their prior experiences and knowledge of standards, pedagogy, content, or other related areas [28]. Essentially a sensemaker accesses prior successes and failures as yardsticks to evaluate the salience of something new or ambiguous. Such a process may lead to an understanding and desire to modify current practice, or conversely may pose challenges to implementation [9]. A pitfall occurs when sensemakers recognize new ideas as overly familiar [11]. When new ideas are hastily likened to existing practices, the results may be “unintentional failures of implementation” [11]. Knowledge often derives from experience but can also stem from engaging with media, literature, and conversation. No matter the source, prior knowledge affects sensemaking because it modifies what is recognized as relevant [41].

Beliefs. Beliefs are evaluative assumptions and firm beliefs rooted in experience can sometimes color sensemaking. For example, if a teacher believes a favorite unit of study promotes an orderly classroom, yet it no longer fits new content standards, a teacher may develop reasoning to teach that unit anyway. Sensemaking filters through a person’s belief system and when that belief system is strong, and not well aligned with a new policy, change is conservative. Sensemakers and sensegivers will gravitate to familiar beliefs when confronted with incongruity [42].

Values. A distinction between beliefs and values is that beliefs are assumptions about how the world works and values represent worth [43]. For example, a teacher may believe the amount of time students spend practicing math is proportional to how well they will perform on a state assessment; but, the teacher may also highly value the benefits of collaborative learning without believing it will help students do well on the state assessment. Values can
act as beacons directing decisions about change but values can also confound sensemaking [11]. When the theme of a policy and leadership sensegiving align with an educator’s values, the reform is more likely enacted [44,45]. People develop reasoning based on their values and that leads to paying more attention to information that is consistent with values and ignoring other information.

Identity. New standards systems are often taken to mean that whatever teachers have been doing is invalid and this can confront an educator’s identity as an expert [46]. The tendency of teachers to preserve a sense of professional identity and self-efficacy may thus result in a negative reaction to new standards systems. Moreover, teachers’ identity and their “good sense” as professional stewards of learning is often dismissed by administrators when it is recognized as resistance [47]. Conversely, a professional identity founded on professional growth can provide teachers a foundation for openness to new ideas [48].

2.2.4. Meaning and Response

At the heart of the SoCS Framework are meaning and response - these concepts are tied together and are shaped by the aforementioned processes and attributes. Individuals enact varying degrees of change (response), which in turn affects the environment within which sensemaking is occurring. That changed environment then becomes the foundation from which educators retrospectively reflect and construe continued meaning [49]. Within a sensemaking perspective, response, and even lack of response, contributes greatly to the environment from which educators draw sense. Thus, response, sometimes referred to as action or enactment, provides an educator with feedback.

Meaning, placed at the center of the framework, does not imply final output but instead indicates ongoing construction of sensemaking. Much of that construction depends on how a person responds to the content standards. Responses to standards may range from a teacher considerably modifying classroom practices to another teacher choosing to continue with the status quo. Individuals and school communities have no single response but a collection of responses to content standards. Those responses contribute to experiences of individuals and potentially affect the culture and structure of the organization, contributing to ongoing sensemaking.

3. The Research Setting

In mid-2016, work began on developing new K-12 science standards in Arizona. At that point, 19 states had adopted a comprehensive set of science content standards, the Next Generation Science Standards (NGSS), based on the NRC’s A Framework for K-12 Science Education [50]. However, the state educational agency (SEA) staff received the directive from the SEA’s chief administrator that the state was not to adopt NGSS but could use the same framework document from which NGSS emerged.

Volunteer developers were teachers, school district STEM personnel, higher education faculty, and content experts. The developers’ working group meetings occurred approximately every four weeks over 11 months. Our research began with observations of these working group meetings during the last five months of the development process [51]. The development of the SoCS Framework coincided with this time period. It was decided that a way to test the SoCS Framework was to assess if it could aid understanding the influences affecting, and sensemaking processes of, the SEA science education staff. The SEA science education staff are key change agents who oversaw development of the science standards and help schools and districts with related transitional changes. Therefore, understanding their sensemaking in relationship to developing and implementing new science standards is an important step toward comprehending systemwide response. Further, SEAs are understudied [52], and this was an opportunity to examine what affects sensemaking of SEA personnel and determine how they envision change around new content standards. In other words, we wanted to understand what was affecting the thinking of these agents of science standards development as they deliberated on the function of science standards (i.e., as sensemakers) and their roles as facilitators and translators of the science standards (i.e., as sensegivers). Using SoCS as an organizing framework, these research questions were addressed:

1. What affects SEA staff members’ sensemaking regarding new content standards?
2. What affects SEA staff members’ sensegiving regarding new content standards?

4. Method

4.1. Cases

The SEA science education staff was comprised of three members. The supervisor, Grace (pseudonym), had been in her position for 15 years. Grace was previously a high school science teacher and during her first several years at the SEA was the only science education staff member. Grace was involved with the development and implementation of the old science standards, established 14 years prior. Judy (pseudonym) had been in her position at the SEA approximately six months when this study began. Judy taught elementary grades for 11 years and continued as a facilitator of environmental education teacher workshops provided by a local energy company. The third member of the SEA science education staff became a member of the staff after the standards development process began and declined to participate.

4.2. Data Collection

Data were collected from two sources. First, field notes taken during observations of the developers working together at the SEA, over a five-month period, provided necessary context. The second, and primary data source, were interviews conducted with Grace and Judy. The interviews occurred a few weeks after the developers completed their work. The interview protocol was designed to discover what each person felt was the purpose and potential value of the new science standards (i.e., rationales); how different channels of influence
shaped their thinking and how they believed those channels will impact others and engender change; if policy levers were affecting them or if they planned to apply future policy levers; and to assess how individual and community attributes swayed their thinking.

4.3. Data Analysis

Following transcription of the interviews, two researchers did an initial independent read-through of the transcripts and then conferred. The point of this first read was to get a sense of how well the interview data mapped to the SoCS Framework. It was noticed that some components of the framework, such as inducements and organizational attributes, never or rarely emerged during the interviews. However, given the unique roles of the SEA staff and the nature of our interviews that focused on personal thinking, the minimal emergence of some components of the SoCS Framework seemed reasonable.

Transcripts were then divided into text fragments and deductive coding applied based on the SoCS Framework. Transcript data were coded if interviewees referred to their personal sensemaking but, because of their leadership roles, codes were also assigned if Grace or Judy seriously deliberated on how others navigate science standards. These visions about others were considered relevant because these ideas could affect their thinking as state-level leaders. If the interviewee indicated a channel of influence affected their perception of the role of standards, or they felt a channel contributed to sensemaking for others, this was coded accordingly into one or more of the channels of influence. Data were coded as policy levers if the interviewees indicated a recommendation, mandate, or inducement affected them or they discussed applying such a lever. Data were coded as a rationality type if the interviewee cued a value-oriented, goal-oriented, or traditional rationality was underpinning an action or goal. When the interviewee noted individual or community attributes (e.g., experience) contributing to their reasoning, the fragment was correspondingly coded.

To further define the nature of the data, brief and often repeated notes were added to the codes assigned to the text fragments. For example, it was noted if the interviewee was referring to their own thoughts or were conjecturing how they believe teachers commonly enact change. Following this scheme, two researchers coded the transcripts independently and then met to negotiate differences. Grace and Judy’s data were analyzed first (cross-case) to identify each person’s signature themes and to detect commonalities and noteworthy differences.

5. Results

5.1. Grace: Shaped by Experiences and Community

Grace derived much of her sensemaking from 15 years of experience at the SEA. It was clear that her experience of overseeing the development of the old state science standards and having witnessed the effects of prior accountability legislation weighed heavily on her thoughts. Specifically, the legislation Grace often referenced was the No Child Left Behind (NCLB) Act of 2001, which was a set of U.S. federal mandates requiring states to establish rigorous standards and accountability systems. She also had significant relationships with science supervisors in other U.S. states that were useful and influential. Following, we describe the dominant SoCS-based themes that emerged from Grace’s view about the new science standards and her suppositions regarding how teachers and school administrators will engage with the new standards.

5.1.1. Lessons Learned from the Assessment Channel and Accountability Policy Levers

The assessment channel of influence and associated accountability policy levers were frequent reference points for Grace. First, Grace was very conscious of how creation of the old science standards was driven by a desire to design clear-cut assessments. Grace emphasized this resulted in teachers perceiving science standards as a long list of performance objectives that, in turn, were assessed via one-to-one assessment items. She believes developers of the old science standards were essentially too thoughtful about developing “assessable” standards and therefore created objectives that lent themselves to writing simplistic test questions. This was exemplified when Grace stated, “the idea was pretty much one standard - one assessment item. So every standard needed to be assessed separately.”

These reflections affected Grace’s approach to the new science standards. During the working group sessions, Grace was observed many times emphasizing to developers that change should not be driven by assessment and they were to not create a checklist of objectives that could simply be addressed by mini-lessons. Instead, she emphasized the need to “write standards as bigger, broader statements where connections can be made” and that standards would drive assessment and not the other way around.

Second, Grace believed lack of policy levers across multiple grades led to inattention of science standards. In Arizona, results from state science assessments have played a minimal role in school accountability formulae and that affected Grace’s thinking. Although NCLB required state-wide science assessment administration, those tests were administered in only three grades, and did not assess cumulative understanding. Years of experience of listening to teachers and school administrators led Grace to reach this conclusion: “Only the 4th grade teachers actually followed the standards because they were assessed on it. Same as in middle school, you often got science taught but again they may or may not align to the standards except for 8th grade which had the assessment only on the 8th grade standards.”

Based on this, Grace influenced others at the SEA to ensure that new science tests would measure cumulative grade-to-grade understanding and not just objectives of a single grade. Moreover, Grace expressed concern regarding how the minimal weight of science achievement results in accountability calculations affected attention among teachers and school administrators. Therefore, Grace was concerned that accountability policy levers that are pulled heavily for math and reading may lead to inattention to science.
5.1.2. Influence of Knowledge and Experience

Grace often accessed her experiences with the development and reception of past science standards when she considered how the new science standards would be received. She noted that Arizona’s old science standards mirrored the National Science Education Standards (NSES) in such a way that inquiry and history and nature of science existed as strands separate from traditional content areas of life, physical, and Earth and space science within the science standards. Because of this separation, Grace had experienced frustration over the years as she attempted to convince teachers to integrate inquiry and nature of science into traditional science topics and not to treat them as separate units of study.

The state’s new science standards advocate for three-dimensional learning, which calls for students engaging with science and engineering practices (e.g., interpreting data), applying crosscutting concepts (e.g., cause and effect), and deepening their understanding of core ideas (e.g., conservation of mass). Given the lessons learned from the old science standards about the difficulty of integration, Grace believes considerable change in mindsets and practices are required to integrate three-dimensional learning. However, she does not believe that making the case for change based solely on learning value carries enough weight to effect change. Grace asserted that three-dimensional learning will more likely be adopted if it is tied to the assessment channel of influence and to accountability policy levers. As evidence, Grace recalled the following from a professional development training about three dimensional training she facilitated that involved principals and teachers:

“We had administrators who came with their teachers, they were there as part of a grant, and [regarding the timeline . . . when we said the assessment wouldn’t be until [4 years later] they said my teachers don’t need to be here and grabbed their teachers and left because they weren’t worrying about new standards or how to teach science effectively until there was a new assessment.”

5.1.3. Cautious about Sensegiving via the Professional Learning Channel

A clear sensegiving vehicle for an SEA is professional learning for teachers. Grace believed professional development is the best means for the SEA to help teachers make sense of the new science standards and effect change. She saw the SEA as a translator of not just the written standards, but also the developers’ reasoning because “we [the SEA] know the standards best ...we were present for all the committee discussions so we know a lot of the thinking the committee had behind the standards.” However, typified by the following statement, Grace was cautious about the SEA not being viewed as a source of lesson plans, but instead should be considered a navigator of the new science standards:

“[the SEA] doesn’t do curriculum so that’s outside the scope, so that happens at the district, what we can do is help develop rubrics or point to rubrics of how do you make sure your curriculum aligns to the standards but those decisions of what curriculum to ultimately adopt are site based and that’s really outside of [our] scope.”

5.1.4. Value-oriented Rationality

Grace expressed vague goal-oriented rationality when she communicated her aspiration of the new standards leading to improved student comprehension. However, this goal-oriented rationality was in support of her more defined value-oriented rationality. Grace repeatedly expressed the value she placed on critical thinking and how that would be supported through well-designed standards. Grace demonstrated the value she placed on deep student learning by pressing the SEA to move away from the NCLB-era goal of simply passing federal review by writing basal student assessments and toward the objective of constructing meaningful assessments that address learning gaps. That is, she had witnessed how the old standards with their small incremental steps were keeping teachers and students from obtaining a broader picture of connected science concepts, and therefore stated, “We want to write the standards where the students can actually think.” Grace’s value-oriented rationale came across clearly in the interviews and also during observations of her repeatedly expressing to developers this type of validation for new science standards.

5.1.5. Sensemaking through a Structured Community

Grace highlighted that she is a member of the Council of State Science Supervisors (CSSS). The group has annual conferences and connects via online bulletin boards and listservs, as well as through phone and email communication. It was clear that the organization provided Grace with the ability to reach out to similarly-positioned individuals. Grace indicated that she has commonly communicated with other SEA science education directors to understand how they are approaching various issues and to check on their progress toward effecting changes.

5.1.6. Influence of the Research Channel

A final part of Grace’s sensemaking signature was the research channel of influence. She indicated scholarly research provides her a guidepost regarding how to best support learning. Grace stated that it was very important to her to “stay current in the research on learning of science” and that, in turn, affected her sensemaking about the role of science standards. For example, through her examination of the literature, Grace came across the research-based document Working with Big Ideas of Science Education [53]. Grace introduced the Working with Big Ideas book to the standards developers and they integrated many of its aspects into the new science standards.

5.2. Judy: Guided by Classroom Implementation and Values-directed

Judy’s experiences as a professional development facilitator and a classroom teacher strongly influenced her sensemaking about change. Her professional identity was in transition as she moved from a curriculum developer to a state-level science education leader. This was evident in her visualization of classroom change and her concerns about impediments focused on teacher resistance. Like Grace, Judy was also value-oriented with a focus on students doing science.
5.2.1. Cautious about the Standards Documents
Channel of Influence

Judy saw two ways teachers may adhere to their old practices versus making substantive changes. The first concern was that the different layout of the new science standards document could lead to inaction or adherence to current routines. Specifically, Judy was concerned that keywords in the new standards would evoke quick acknowledgement without thoughtful deliberation. For example, while discussing how a teacher might engage with the standards, Judy stated the following, pretending she was a teacher, “I see that it says energy standard. Well, that’s what it used to be in the old standards so I am just going to do the same thing.”

Further, Judy was concerned that teachers’ experiences and beliefs about what works well with students will mitigate the impact of new science standards. She did not voice concern of outright opposition but instead a worry that teachers will retrofit the new standards with their existing practices. This aligns to what Spillane et al. [11] discussed regarding people seeing what is new in terms of what is already known and believed, or as Judy put it, “people tend to take new approaches and existing approaches differently depending upon what they’ve done before.” Judy was similarly concerned that dramatic changes in the layout and depth of the new standards, such as the NRC Framework-based three-dimensional learning, might alarm some teachers and prompt stress and inattention:

“My worry is that when they see them written like this, when there’s three different dimensions - I have to learn, I have to know the content, I need to be doing engineering and science work and I also am trying [to address] cross-cutting concepts - that there could be confusion for them. And they might get nervous about that and it might get pushed back.”

5.2.2. Experience with Accountability Levers

Similar to Grace’s experience with the effects of accountability, Judy was concerned administrators will continue to believe the way to achieve high marks on the state’s accountability calculations is to focus on mathematics and reading. Based on experience, Judy worried this focus could transform science instruction into a front for mathematics or reading. To illustrate, she recalled her elementary school experiences: “Oftentimes teachers say ‘okay, well my administration wants me to do science or I feel like I can do science so I’m going to teach how to write a paragraph but I’m teaching science.’ That’s not really teaching science.”

5.2.3. Value-oriented Rationality

Grace and Judy both placed high value on conceptual learning and on students engaging with scientific thinking. Like Grace, Judy exhibited value-based rationality by emphasizing the new science standards “needed to be developed” to promote critical understanding of science. Judy often put this in terms of the type of thinking scientists and engineers routinely carry out. This connection to scientists and engineers was very important to Judy and she stressed that the new standards provided a means to make connections to careers. The value Judy placed on engineering practices was represented by her mentioning the word engineer or engineering 13 times as compared to twice by Grace during their interviews.

5.2.4. Connecting Professional Learning and Curriculum Channels

Both Grace and Judy believed professional development is the best sensegiving tool the SEA has at its disposal. However, Judy discussed how the professional learning channel would bring about change only if it is clearly connected to the curriculum channel. Whereas Grace thought professional learning stimulated change by helping teachers to understand the value of the new science standards, Judy emphasized that professional learning is likely to bring about change when it demonstrates useable curriculum. For example, Judy stated, “it’s okay ideally to give [teachers] some content on how they would roll that out since, like reading what something is, is very different than actually how to implement it.”

5.3. Summary of the SoCS Framework as an Analysis Tool

Because a chief goal was to test the applicability of the SoCS Framework, the results of the two cases are briefly revisited to scrutinize suitability of SoCS as a research tool. As an analytical tool, the SoCS Framework led to an understanding of how experience and values mediated the ways each participant perceived and invoked the primary drivers—such as accountability (policy lever) and standards documents (channels of influence). For example, Grace’s experience at the SEA with accountability-based policy levers prompted her to be particularly conscious of the assessment channel of influence. By contrast, Judy’s recent classroom experiences led her to be more concerned about teachers holding fast to old practices.

The SoCS Framework also highlighted the important role of framing rationales. Grace and Judy demonstrated solid value-oriented rationales underpinning their sensemaking and sensegiving. Their endorsements of the new science standards were strengthened by their view that the new standards are a means to students engaging, I have to know the content, I need to be doing engineering and science work and I also am trying [to address] cross-cutting concepts - that there could be confusion for them. And they might get nervous about that and it might get pushed back.”
of our research design or due to autonomy of the science education staff. That said, the influence of community and collegial culture on teachers and other educators as they consider content standards has been demonstrated in the literature [29], and remains an important conceptual area of the SoCS Framework.

6. Discussion

The cases presented illustrate the use of the SoCS Framework. While the SoCS helped us understand Grace and Judy’s sensemaking regarding standards creation, further research applications are needed among teachers and school administrators to test the framework. At the same time, it is encouraged for researchers to consider ways to adapt the framework to their unique settings.

Past sensemaking schemata, such as Weick’s seminal work [7] are useful in helping to understand how various interactions and resources contribute to sensemaking and ensuing change. However, past frameworks are typically broadly stated and do not incorporate specific drivers of sensemaking around standards, such as channels of influence and policy levers. Because the SoCS Framework specifies both primary drivers and sensemaking moderators, it provides a holistic conceptual tool for understanding the process through which educators understand and enact content standards. The SoCS Framework integrates two key conceptual approaches to understanding standards implementation and provides a common vocabulary of concepts in this important area.

However, the SoCS Framework is not a recipe nor an input-to-output flowchart. Instead, the SoCS Framework aids in plotting how individual and organizational attributes intermix with sensemaking mechanisms and processes in the arena of content standards. We return to our statement that at the center of the framework is an individual, situated in a community, who is addressing the question how will I respond to these content standards? As a research tool, the SoCS Framework can hopefully support understanding how this question is resolved and change effected. As a tool for practitioners, the framework provides a way for educators to reflect on what is impacting their interpretations of content standards, what is facilitating implementation, and what is inhibiting and possibly even creating roadblocks. Moving forward, the authors welcome feedback regarding application of the SoCS and how others adapt it to their needs.

References


