

Vernacular science cultures in a rural New Hampshire school community: construing vaccination before COVID

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1. Introduction and objective

Research continues to show that public knowledge about science content, new findings, practices, and ethics are far from satisfactory given the importance of science to their own lives and the nation's (Pew Research Center 2015, Funk and Goo 2015). Much research on public knowledge about normative science has taken as its unit of measure the individual (NAS 2016). What produces this sub-par understanding? This paper suggests that the role of vernacular science in the production of science (il)literacy has been underexamined.

Knowing and reasoning are social processes, resulting from socially embedded inquiry, which shapes how normative science is construed (NAS 2018). Consequently, a theoretically rich understanding of science learning must take account of the social/cultural context of knowing and more especially the processes by which science is understood, constructed, and used in everyday settings — the 'vernacular' culture of science (Wagner 2007).

During the recent COVID crisis, Americans have become aware of controversies about vaccination, as there have been since the late 1700s. At the time of the research reported here, in 2018-19, there was a nation-wide controversy about vaccinations — for measles and whooping cough. Clusters of cases occurred around the country, mostly associated with communities espousing one or another counter-cultural approach to education (Dubé et al. 2021).

Based on an ethnographic study of a parent support group, this paper will present data showing how the existence of alternative epistemologies, rather than political identities, shaped parents' responses to childhood vaccinations. This framing is distinct in important ways from accounts of science attitudes within the framework of "motivated cognition" (e.g., Stein et al, 2021, Kahan et al. 2011). In the present study, mainstream science is seen to be received (or rejected) on the basis of alternative *scientific* paradigms held within the community.

The paper will present data bearing on the following research questions:

- A. What were the science cultures present in a parent support group?**
- B. How did each of these science cultures construe mandates to vaccinate children for such "childhood diseases" as measles or whooping cough?**
- C. How were the conflicting values of the science cultures negotiated in common space?**

2. Theoretical framework

Much of the research on public attitudes towards and knowledge of science has been conducted by survey or other measures of individual attitudes and knowledge, whether of specific bodies of knowledge or specific aspects of science practice (Bauer et al 2007, NAS 2016). Research on motivated reasoning and similar constructs focus on the individual as the unit of measure — as citizen, consumer, patient, or science learner (Stein et al 2021, Kahan et al. 2011, Kahan et al. 2012, Michael 1996).

Yet an important line of thought, reaching back to Dewey and Vygotsky (Greeno 2006), sees that knowledge is held in groups and is produced through communication and interaction, including disagreement, e.g. Holland and Lave's "local contentious practice" (2009). Many of the inputs that an individual receives come by way of social connections — recommendations from friends, shared links, professional communications. The social "conduit" has been shown to provide an important kind of

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"metadata," marking the information as personally relevant within the community (e.g. Gross 1948, Ryan and Gross 1950, Lehmkuhl 2008).

Vernacular science is constructed through conversation, and is situated in specific arenas of action, *communities of interest* (Fischer 2001) or practice (Lave and Wenger 1991), groups such as garden clubs, hunting associations, parent groups, business associations, etc. Each community has its own body of knowledge, practices, and discourse. Vernacular science (not always recognized as science, Drayton 2018), like other kinds of knowing, is a social achievement, and is one part of how a person enacts their identity as they pursue their purposes within the multiple cultures they participate in (Irwin and Wynne 2003). The research on folk and vernacular science in its various forms has shown that a culture may well have a systematic account of (some of) the phenomena of the world that is different from, or even in contradiction with, modern Western science, which yet has integrity as a meaning-making system.

Vernacular science, like any other kind of knowing, is a social achievement, and it is one part of how a person enacts their identity, and plays their role within the multiple cultures they participate in. Social practice theory (Holland and Lave 2009) suggests that this complex interaction of people with diverse backgrounds and intents within social settings that are at the same time arenas of identity, is the source of the kinds of disequilibrium that make learning — both possible and necessary.

A simple binary opposition between "normal" science and "folk" or vernacular science (risking "illusory depth", as Rozenblit and Keil 2002 have it) can pose the persistence of vernacular science as a problem to be explained and then solved. We suggest rather that vernacular science is embedded in (and serviceable for) local communities of interest, and is part of how people engage in "the process of authority" (Dewey 2008). Its relationship to mainstream science can be conflictual, confounding, or complementary/synergistic.

If we accept that both kinds of science — vernacular and "mainstream" — are exploring the same world, and that the goal in both cases is to achieve reliable and useful accounts of that world, then it is not surprising that there will be parallelisms and congruencies at many points between the two systems, as well as considerable disagreements. In modern American society, with mandatory education and pervasive media coverage of science news, most individuals are exposed to mainstream science. To what extent can we expect there to be "science subcultures" in which there is some body of knowledge and practice which participants can master, and use with confidence in the pursuit of their interests?

We conjecture that the matter may be somewhat analogous to that of bilinguals in a society with a socially dominant language. The minority language will be heavily influenced by the dominant, matrix language, borrowing words, constructions, sounds, and sometimes other elements — yet still retaining substantial independent identity as to lexicon and grammar. Research on traditional ways of knowing among Indigenous people in the modern USA suggest exactly this kind of interchange (Atran 1987, López et al. 1997, Iseke 2013). Further, the continued widespread persistence in the US of confidence in pseudo-sciences such as astrology or homeopathy is suggestive of such a "bilingualism."

Regardless of the importance of techniques or specialized practices that serve people's ends in their communities of interest, their knowing and doing, and their sense of themselves in those communities, is largely mediated by language -immersed in discourse processes. Discourse, gossip (Foster 2004), and discussion are both *revealing* and *socially constitutive* activities (Bailey et al. 2014, Condor & Antaki 1997, Schultz 2001, Halliday 1990) that contribute to the development and transformation of social norms. Where the discourse is concerned with the way the world works, or the way you work with the world, science in some form will be present. It is woven into the fabric of our embodied, social lives — hence our investigation of this *invisible fabric*.

5. Context in the literature

This research is informed by work in diverse fields of inquiry. Four seem especially relevant: i) Public understanding of science; ii) cultural cognition; iii) how science is known in folk science; and iv) vernacular science as a community process.

i. Public understanding of (mainstream) science. The field of "public understanding of science" (PUS) was galvanized by a report published by the Royal Society in 1985 (Royal Society 1985), entitled "The public understanding of science" which showed that people's actual knowledge about science content tended to be rather limited. Other studies have painted a similar picture (e.g. National Science Board 2018, Pew Research Center 2015) and framed the problem of the *lack* of public understanding in terms of inadequate communication and transmission of high-quality science information. Later studies, however, argued that the lay public, rather than being a target of communication, was seen to have other kinds of agency in the transmission of science information (Irwin and Wynne 2004, Wynne 2004, (Durrant 2008)

The recognition of locally valued knowledge about matters of import to a community (Wagner 2007, McKechnie 1996, Solomon 1994) led to the recognition and problematization of the question, "Why do people resist the findings and the authoritativeness of science?" The processes of resistance are taken up in Michael's (1996) study of "ignorance as a construction"; Zerubavel (2007), Norgaard (2011) and Taylor (1982) examine related processes. People engage in their local communities and are part of a "figured world" where their activities are structured the myriad forces that shape their world (Holland et al. 1998). Identities, formed in the process of making sense of local experience and local knowledge, can then come into conflict when they are challenged by more normative models of science. Other scholars point out the problems that arise from framing PUS in terms of a deposit of knowledge existing in an individual's head; it is important to think about how scientific knowing comes about (Roth 2003). Knowing is a social thing.

ii. Cultural cognition and identity. Considerable research now suggests that how we hear and interpret evidence about a challenging new topic—the fundamental social-psychological process that Goffman called "framing" (Goffman 1986)—plays a critical role in the "uptake" of controversial science (Swim et al. 2009, Goebbart et al. 2012, Kahan et al. 2011, 2012, Moser and Dilling 2007). Through our frames, we assign values to information and events, and create meanings about them against a backdrop of social and cognitive preferences, values, and commitments. People tend to lend more credence to sources who are seen to share their values and interests (Moser 2009, in press, Akerlof et al. 2011). This should be seen as the development of community understanding, which includes both the scientific evidence and also a shared understanding of differential impacts on different sectors in the community, differential costs of change for different stakeholders, and differential capacities to respond (Weber and Stern 2011, Moser and Berzonksy 2013, Burger in Goffman 1986)). F

iii. Folk science and alternative ways of knowing. The study of science or scientific knowing that occurs outside the mainstream of Western intellectual history is embedded in the long tradition of research and speculation on meaning in other cultures. Thus, Malinowski's reflections on meaning among the Trobriand Island people was seminal precisely because of his privileging of the speech community in pragmatic context — situated meaning.

Western scholars have tended to use Western science as a canon against which to evaluate the "correctness" of folk or indigenous sciences. On this comparison, it has been argued that, whatever else can be said about it, folk science is not comparable in quality to Western science. (Keil 2003, 2010, Rozenblitt and Keil 2002). But anthropologists have produced accounts of indigenous scientific systems that clearly evince improvement over time, such as the remarkable system of Polynesian navigation and navigation education recounted by Gladwin (1995). The research on folk taxonomies allows for further explorations of the principles that underlie the distinctions that are made in a taxonomy, and therefore revealing of theoretical frameworks (Coley and Tanner 2012, López et al 1995, Rosch et al. 1976, Rosch 1978).

iv. Other studies move more deeply to understand, not *what* is known, but *how* it is known in diverse indigenous knowledge systems (Aikenhead and Ogawa 2007). For example, Medin et al. 2007

compare Indigenous and European-American experts on fish — what they know about relationships among species that both are familiar with from fishing the same area in Wisconsin. The Indigenous fishermen seem always to see the species in ecological context, while for their non-Indigenous neighbors, ecological information needs to be retrieved and reasoned about. Medin et al. speak of "framework theories" which underlie differences in knowing and reasoning about organisms. These frames shape the questions they will tend to ask, the inferences they will tend to make, and the relative importance they give some factors over others (Bang et al. 2014, Bang et al. 2007, Coley and Muratore 2012, Medin and Bang 2014).

v. Community process: a missing dimension of "the public understanding of science."

Much of the research on public attitudes towards and knowledge of science has been conducted by survey or other measures of individual attitudes and knowledge, whether of specific bodies of knowledge or specific aspects of science practice (Bauer et al 2007, NAS 2016). Research on motivated reasoning and similar constructs share the tendency to treat questions of science understanding in terms of the individual respondent as the unit of measure — as citizen, consumer, patient, or science learner.

Yet an important line of thought, reaching back to Dewey and Vygotsky (in the modern tradition), sees our learning, knowing, and acting as sociocultural processes (Greeno 2006). Furthermore, research in the same tradition sees that knowledge is held in groups and is produced through communication and interaction (including disagreement, e.g. Holland and Lave's "local contentious practice" Holland and Lave 2009).

In our society, information about science is available through many channels. Yet many of the inputs that an individual receives come by way of social connections — recommendations from friends, shared links, professional communications — through the medium of situated discourse processes. The social "conduit" has been shown to be an important kind of "metadata," marking the information as personally relevant and with some sense of its importance (e.g. Gross 1948, Ryan and Gross 1950, Lehmkuhl 2008). The research on climate change communication that shows the important role of "trusted messengers" makes a similar point (Moser 2009, 2013, Akerlof et al. 2011).

Although some sociologists (Putnam 1995) have described an "atomizing" trend in modern American society, there remain a rich diversity of associations in civil society gathering around purposes ranging from public service to hobbies or other leisure pursuits, to the learning, practice, and transmission of traditional crafts, arts, or other activities (Pew Research Center 2011, Wuthnow 1994).

Relation to science education. It may be asked how this study can contribute to a better understanding of education (in particular science education) and indeed to its increased effectiveness. We suggest that the *community is the agent of education*, to a significant extent. Considerable research has established that family and peers make an important contribution to students' attitudes and self-image or self-efficacy as learners and "stakeholders" in science (e.g. Dewitt et al. 2011, Wortham 2006, Breakwell and Beardsell 1992, Tinsley 1992). Bronfenbrenner's "mesosystem," as part of his "ecology of human development" (1979), is a pertinent and powerful model for the kinds of learning exchange that goes on in communities, and that creates and informs the shared worldviews that children learn, adopt (and of course sometimes rebel against) (Wharf 1988, Weber and Stern 2011, Dewey 2008). In that model, explicit/formal and implicit/informal educative processes are seen as complementary and interacting. The settings and relationships are the daily environment within which we form and enact our identities, and shape or refine our explanatory frames (Goffman 1986), and thus are strategically important for any wide-scale, effective shift in education (Tan and Calabrese-Barton 2008, Twigger-Ross and Uzzell 1996).

Summary of literature. These bodies of literature suggest that:

1. The frequently-lamented lack of public understanding of science (whether considered as a practice or as a body of results) cannot solely be attributed to poor communication or inadequate education alone: more must be going on.

2. When people use science in their daily lives, for the furtherance of their personal ends, they may understand this knowledge differently than mainstream science does, and may not be aware of any contrast or relationship.

3. People maintain and propagate their cultures (including local or regional subcultures) by means of cultural resources and practices, which come into play in when they encounter mainstream science that is unfamiliar or controversial within their frame of reference. Webs of relationship and discourse mediate the functioning, maintenance, and change of cultures.

4. The research on folk and vernacular science in its various forms has shown that a culture may well have a systematic account of (some of) the phenomena of the world that is different from, or even in contradiction with, modern Western science, which have integrity as meaning-making systems.

6. Most research on this kind of conflict has examined and searched into individual knowledge, attitudes, and reasoning. Much less has been done to describe and analyze the discourse-embedded community processes by which local science knowledge is articulated within community values, disagreements are resolved, or new science incorporated.

3. Methodology

Setting: The ethnographic research reported here was conducted in 2018-19, through participation in a parent group in a school (it will be called The School in this article)², part of a world-wide philosophical movement originating in the early 1920s (I will refer to this as The Movement). I joined the group after speaking about my research with a "gatekeeper," one of the parents who had gathered the group.

The study sought to understand

[a] The community context

[b] The science that is relevant to their interest;

[c] The structures and sources of information and authority relevant to science of interest to their practice;

[d] Processes of disagreement and repair

Coordinated observations, interviews, and document analysis (where relevant) will produce data bearing on several dimensions of interest, as expressed in the following research questions:

[a] The community context: What are the purpose(s) and practices that are the *raison d'être* of the group? How did it come about, and how long has it continued? What is the socio-economic setting of the group? What is its composition (by age, gender, ethnic group, etc.)?

[b] How does each community describe the science that is relevant to their interest? What science is central to the group's interest?

[c] What are the structures and sources of information and authority relevant to their science of interest within and beyond the community?

[d] When community-relevant science is discussed, or used in deliberation or discussion, what kinds and uses of argumentation and evidence are evident?

[e] In cases of disagreement or differences of opinion about new or controversial practices, or concepts, what processes, customs, or structures support and frame the discussion or decision-making, and how is resolution reached and articulated?

Data sources

The results reported here draw on three sources of data:

² All names, including those of the school and the movement, are pseudonyms. All methods and instruments are approved by TERC's Institutional Review Board.

Field notes. When possible, field notes were recorded in the field situation; where the situation required, the researcher wrote up descriptive and reflective field notes as soon as possible after leaving the field site (Emerson et al. 2001; Clifford 1990).

Interviews were recorded and transcribed for analysis.

Documents were collected from websites or other sources, including by request from group members.

4.5 Analysis

Data were recursively analyzed to test emerging hypotheses as they developed from interpretive work (LeCompte and Schensul 2013). A grounded-theory approach to the coding (Miles et al. 2013) used an initial set of contextual codes, and additional categories derived from the research questions. During analysis, additional themes and potential codes were identified. Hypotheses were “member checked” to verify or deepen analysis (Denzin & Lincoln 1994; Stake 1995).

Analysis

Continuous analysis of data will start from the beginning of data collection, allowing us to test emerging hypotheses as they develop from our interpretive work (LeCompte and Schensul 2013). All data will be entered into Dedoose™ to facilitate collaborative analysis.

Data of all kinds will be analyzed and coded for evidence relating to the research questions above, and used as the basis for developing a model of the science culture of each community of interest. We will take a grounded-theory approach to the coding (Miles et al. 2013), using an initial set of contextual codes, and additional categories derived from the research questions. During analysis, researchers will identify additional themes and potential codes. As hypotheses arise, we will have opportunities to “member check” to verify or deepen our understandings (Denzin & Lincoln 1994; Stake 1995). The analysis of each case will be written up in a narrative summary. From these summaries, we will construct charts or tabulations of results to facilitate comparison of cases, and to identify areas needing further data in each particular case.

4. Results

The complexity of attitudes towards science are evinced in comments from a parent who had two children in the school. She describes what she has seen as atypical scenario:

"I heard So-and-so had strep, did she really have strep?" I don't know. Gosh, and then you can get into, are you going to treat it with antibiotics or whatnot, or are you going to treat it with that? And then there's a lot of, "Well, I wonder, you could try this herb or that oil or this other word that I don't know what it is." ...I don't think there's as many people who would say, "Yeah, we just went to the doctor and we got our prescription and he's on day six, so we're good."

She described her family as positive mainstream medicine:

We lie. We're very much pro-western medicine. The kids are fully vaccinated. We're not going to suffer through, we're not going to try to wait out strep. I'm getting the drugs for it, the antibiotics, but I'm definitely not going to say that out loud at Pine Hill.

A. What were the science cultures present in this community? What structures or processes of authority or expertise were present?

It became evident that there were three main points of view on vaccinations for childhood diseases.

[1] "Philosophical" parents had come to The School because of the educational philosophy that underlies it. Within that philosophical stream, there are elaborated alternative views of education, personality development across the life-cycle, agriculture, and medicine, each with a decades-long history of research and practice, training and accreditation programs, and academic and popular books, websites, social media, and periodicals. The philosophy gave them a rich explanatory framework within which decisions about vaccination were situated.

Health and physiology are seen in light of several fundamental processes (sometimes referred to as "forces"), arranged in a hierarchy of organization whose basic structure has its roots in Aristotle's science: (1) formative physical forces, to which all physical objects (animate and inanimate) are subject ("mineral kingdom"); (2) nonmaterial formative growth forces which interact with the physical forces to shape the forms of non-animated living things, such as plants or fungi; (3) additional non-material "soul" forces that interact with the first two forces, and result in animate, individualized organisms with integrated nervous, circulatory, and sensory systems (e.g. animals); (4) Explicitly spiritual forces at work in *Homo sapiens*. Humans thus are characterized moreover in their organization by three core systems, called "nerve/sense"; "motor/metabolic" and "rhythmic." (Kienle et al, 2013) The philosophy sees itself as working in complementary ways to mainstream medicine and science, and has officially affirmed the value of vaccination. Nevertheless, some adherents are skeptical of "allopathic medicine," and avoid it whenever possible.

The "philosophical" group of parents takes its lead from experienced, usually older, practitioners of the Movement's philosophy, such as certain highly respected teachers, described by a parent as "the veteran [adherents] that the younger generation of teachers are going to learn from."). Some of these respected persons are strongly opposed to any vaccinations, on the basis of their interpretation of the philosophy's theories about how to intervene to prevent or cure disease.

it's on [philosophical] grounds. I was in a...study group recently where [some argued], very, very adamantly if children keep coming into the world and are vaccinated so heavily, we as a culture, or we as the human race, will lose access to the spiritual world. It is so harmful.

When asked, "How does that work? Do you understand why would that be so harmful?"the parent elaborated:

Something about their bodies being less pure or something...there's some sort of distancing from their true humanity with all the toxicity, so vaccines, and pesticides, and even all of the cell towers. All of this stuff is really blocking our connection to the spiritual world

Such parents seek out physicians who are certified as Movement practitioners as well as MDs, and practice spiritual disciplines (such as specific kinds of meditation, study of Movement literature, and celebration of seasonal festivals). They also tend to pay close attention to their diet, especially the source of the food and the ways that the food was produced. Though not a Movement product, Fallon's *Nourishing Traditions* (2001) is a cookbook likely to be found in most homes of such parents.

[2] "New Age" parents were attracted by the School's "whole child" pedagogy. Many subscribed to ideas from the "holistic parenting" movement widespread in Europe and North America, placing a high value on experiences in nature, on storytelling, the arts, and community life, "natural" foods and medicines.

"Holistic parenting" is an organization that's worldwide. I believe. There was a really active branch here in this area. Several of our parents were leaders in the holistic parenting organization, and this was years ago. They used to invite [a teacher in the School] in to even

give talks about the school. It was like this very kind of like-minded, healthy, kind of enrollment tool for [the School].

The parents in this group were not particularly well-informed about the principles on which The School is founded, but tend to assume that their own worldview is in harmony with that of the Movement. Their authorities included a range of "health influencers" on the Internet, as well as trusted figures in the local community. There are elders in this community as well — parents who have been active in the holistic parenting movement, or otherwise worked to develop an elaborated theoretical account of health and wholeness, both for their children and for themselves.

At least some of these parents arrived at their position as the result of a search for resolution of intellectual or spiritual conflicts that made them skeptical of conventional authority. From field notes:

One such parent (MJ) told me that he had attended one of the major military academies. As he recounted in our first conversation, 9/11, the wars in Iraq and Afghanistan shook his confidence in established authorities. He found that the "war *on* terror" was turning into a "war *of* terror," which he wanted no part of. It seemed important to seek information that could help him make up his own mind. He discovered a whole range of "alternative" media, especially on the Web, in which others were asking the same sort of questions, and seeking untold stories, and overlooked (or marginalized) data that mainstream authorities did not take account of, and sometimes even intentionally refused to engage.

MJ was uncomfortable with math (especially) and science, but in HS he challenged himself to take AP bio and other science courses, and although he had to work hard on them, he did all right, and came to see their interest. Later, he had mentors who got him interested in the anatomy and physiology of athletics, and in nutrition and health. These interests have continued, and when his son was born it seemed really important to him and his wife to learn all they could to give him the healthiest possible upbringing. He discovered the Weston-Price Foundation, and Sally Fallon, and their ideas about diet made a lot of sense to them. They had been moving towards vegetarianism for health reasons and also ethical ones (he mentioned climate change and the role of domesticated animals in greenhouse gas emissions). But the Weston-Price program, and *Nourishing Traditions*, seem more promising for human health.

While it can be seen even from this story that for some of these parents, their philosophical stances were defined in reaction against conventional science and medicine. In some accounts there is also a search for mysteries that confound the conventions, but open the door to potentially exciting or inspiring alternatives. When the conventions are questioned or thrown out, and arcane alternatives are encountered, they can fill in the gap. MJ felt that mainstream explanations for COVID were not credible:

I think COVID is a real puzzle, it's like it's so many different things — affecting the lungs and heart, and kidneys. Hardly seems that it could be one specific organism, so the explanation that it's this virus doesn't seem to make a lot of sense.

Searching for answers, MJ found a school of thought that offered possible explanatory theory.

It was at the beginning of the COVID pandemic. I just was looking for answers, and some of the alternative media I was already familiar with were beginning to raise questions. I think it was there that I heard about Tom Cowan and the "contagion myth" (Cowan and Morrell 2021).. he argues that viruses are not actually organisms, but rather waste products, they are exosomes that the cells produce under stresses of various kinds. They can't be detected except by cell culture, and they don't have any metabolism - -they don't have digestion or anything like that.

MJ and other "New Age" parents in the community subscribed to additional, elaborate theories which purported to link respiratory disease epidemics to innovations in electronic mass communication methods, starting with the telegraph and ending (so far) with the implementation of 5G cellular networks (linked by these authorities with the emergence of SARS-COV-2 and the associated COVID

pandemic (see Firstenberg 2020, and Cowan and Morrell 2021). Many of the authorities in this general area subscribe also to various versions of the long discredited ideas about an "élan vital" or "vital force" which differentiates living matter from nonliving. It is not surprising that some New Age adherents find their ideas akin to those of the Movement, and consequently become interested in that alternative philosophy.

[3] "Mainstream parents" followed the guidance of mainstream medicine, vaccinating their children, and making use of "allopathic" medicines as prescribed by their doctors. These parents did not always understand the claims of mainstream science, but relied on the warrant of its normalized status, and "trusted the experts." They saw themselves as a marginalized group in the School.

Each of these groups was well-represented in the parent body. Each of them appealed to some authority to support their position, relating it to more general theories about human nature and mainstream science. Consequently, when a new scientific or health topic came up, they had a framework within which to interpret and evaluate the new idea or practice.

B. How did each of these science cultures construe mandates to vaccinate children for such "childhood diseases" as measles or whooping cough?

Philosophical parents: As discussed above, the medical authorities of The Movement have asserted that vaccination is a useful medical procedure. Nevertheless, some in The Movement are vaccine-averse, owing to possible negative effects on the body's systemic health and robustness to disease in general and an alternative account of the body-mind relationship that draws on some aspects of herbal and other "naturopathic" medicine. These parents therefore objected to any school mandated vaccinations or masking requirements. Indeed, since the state in which the School is located had not enacted any such mandates, there was a dramatic rise in enrollment at the School owing to an influx of families from other states across the country where there were mandates.

New Age parents. These parents generally shunned vaccines for childhood diseases. The "New Age" movement is eclectic and wildly diverse; hence the "New Age" parents offered various reasons for their position, ranging from fears about possible negative side-effects of vaccines, to a widespread view that much disease is the result of environmental factors such as air or water pollution, stress, or pesticide residues in foods.

Mainstream parents. The main source of authority for these parents' attitudes about vaccines was their physician, supplemented by media or other sources. Such parents might or might not know how and why vaccines "work," but the whole of mainstream science and medicine served as a basis for their decisions. In a sense, they could take for granted the established findings of mainstream science and medicine — without necessarily understanding them in depth.

C. How were the conflicting values of the science cultures negotiated in common space?

As illustrated in parents were aware of the diversity of opinions about vaccination and related topics in their community. Yet in the parent group an evaluative discussion of vaccination was notably absent. Individuals who were interviewed about the issue confirmed that this absence of overt disagreement on certain high intensity topics was a persistent feature of the group (another issue was students' use of "screens" at home and at school). With no accepted leader or mechanism to broker disagreement in a way that maintained safety for all, the parents constructed silence (Norgaard 2011, Zerubavel 2001, Taylor 1982). They tacitly created common ground topics for *public* engagement, marking other topics as "backstage" or *private* matters. Consequently, no consensus was reached, and the same factions emerged when COVID came on the scene.

Some informants noted that there were noticeable changes in community cohesion in recent years which may have contributed to the preference for silence rather than energetic engagement.

ZS felt that some of the dynamics [seen elsewhere] are at work, and that parents in this school community do not connect with each other as much as they did when she first was part of it. Some of this she attributes to the increase in 2-earner families, and also the increase in families living at a distance, or having their children come to school on the school's bus, so that the parents do not naturally come to the school as regularly. There used to be a lot of complaints about the "enforced volunteering" that was part of the school culture, but she felt that in those days (perhaps 5-10 years ago) people also realized that by acquiescing and participating, they built up relationships that were authentic and valuable. She noted in this connection that class evenings used to be monthly, but now are only 3 times a year. This was reinforced by a general "jump to skepticism and criticism."

This same parent also mentioned an interesting generational development reported by several families in the community: the parents, adhering to their New Age or Movement analyses, were anti-vaccine, while their children (whether still at home or grown and living in the area) adhered firmly to the Mainstream understanding of the pandemic, its mechanisms of spread, and methods for prevention.

"You're compromising other people who might be immune deficient or who have health problems, who can't be vaccinated and you're doing other people harm." Like, that argument I hear quite a bit...I hear it quite a bit from my own daughter.

5. Conclusions and significance

As part of a larger study of vernacular science in rural New Hampshire, this paper reports on the interactions among differing vernacular science theories about vaccination discernible in a parent support group. A simple opposition between "normative" science and "folk" or vernacular science (often with the implication of "illusory depth", as Rozenblit and Keil 2002 have it) can pose the persistence of vernacular science as a deficit to be explained and then solved.

I consider, rather, that vernacular science is embedded in (and serviceable for) local communities of interest, and is part of how people engage in "the process of authority" (Dewey 2008) within their daily sphere of activity. Its relationship to mainstream science can be conflictual, confounding, or complementary/synergistic. Vernacular science, situated in such communities with their particular expertise, knowledge, and subjects of focus, is characterized by at least the following:

- Specific persistent matters of interest and action
- Relevant knowledge and expertise rich enough to engage with the characteristic problematics of the community's interest, including some theoretical framework within which investigations, phenomena, and experience can be interpreted, and actions designed, implemented, and learned from..
- Typical practices and routines for enacting the interest
- A gradient of expertise and experience, in respect to which some are recognized as authorities in one or all areas of the community's interest and practice

In the groups identified in this study data, these characteristics are discernible, though often implicit. The parents, after all, share a practice that is unlike, say, the practice of blacksmithing or even teaching. Each family has specific children to raise, within the specific constraints of the family culture and economy. With regard to vaccine usage or other aspects of health care, they are not themselves practitioners, but rather drawing on the work of the practitioners. Yet each of the groups

identified hold a philosophical/theoretical orientation which mediates their choices about vaccination and the authorities they will credit. In a sense, therefore, they participate in the Philosophical, New Age, or Main Stream communities of practice as part of the "market" or engaged supportive public for each theoretical stance.

Furthermore, it is clear that news and information about vaccination (as about other medical or scientific matters) are typically interpreted in light of each group's reigning theoretical preferences. To take one example from the data presented, the parent who places a strong reliance on the "food as medicine" approach, and the nutritional theories of Weston-Price, makes choices consonant with those values, while parents who are Mainstream in approach are not moved by theories about vaccines and viral disease proposed by such apparent "new age influencers" or authorities.

Now, social practice theory (Holland and Lave 2009, Holland et al. 1998) suggests that this complex interaction of people with diverse backgrounds and intents within social settings that are at the same time arenas of identity, is the source of the kinds of disequilibrium that make learning — both possible and necessary. It might be expected therefore that a community with such strongly marked and differing orientations would be ideal for a negotiation of community consensus to support a shared approach, which could in turn lead to a deepening of understanding about the shared approach to health care or child nurture within the school community.

Yet in fact, as has been discussed above and elsewhere (Drayton 2023, 2022), in this community the diversity around controversial issues like vaccination has in fact discouraged discussion about those issues, or even about the bases on which people differ. This appears to be because decisions and attitudes about science and medicine are seen to be subordinate in importance to the commitment to the school. This is the case even though parents' choice of the school at least in part is motivated by the beliefs which characterize one of the three (sub)communities identified in this study. Thus, the overarching value of comity within the school leads to the construction of silence about certain topics. Therefore, attitudes about vaccination in a sense were formulated well before the era of COVID controversies, and formulated also independently of the question, whether to vaccinate or not. The vernacular science communities expressed in the Philosophical, New Age, and Mainstream communities are elaborate and robust enough that they can be applied to a wide range of questions of interest to the parents at the school, and to those in the geographical area who share in the same vernacular science communities.

The home and its community are significant components of any child's learning ecosystem. The way that families construe questions of science, medicine, and technology have a significant impact on their children's stances to those subjects, and affect the political climate within which a school operates. If parents are participants in communities of interest whose discourse includes a body of vernacular science, then this may contribute to the strengthening and refinement of community norms about science. The role of vernacular science communities in mediating public interpretations of mainstream science deserves more careful study in the development of an adequate understanding of science knowledge, and science learning in contemporary society.

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