

Tentative Categories: Employing scientific practices to pursue answers

Research Participant	Initial codes (Gerund-based)	Transcript Quotes	Early Memo
Ellen	Observing domicile, Describing unexpected (undesired) results Researching bumble bees Adjusting location based on reading	“Nothing ever ... went into that little house last year so...” “Then, over the winter I was reading and I'm gonna move it into another part of the yard ... on the north side.”	Previously “Following project protocols” → Acting scientifically (makes it sound unauthentic), Performing scientifically (makes it sound like they're being assessed...), Operating scientifically (sounds too robotic)...”Pursue answers” as in either trying to design a successful domicile or ...
Charles	Placing kit domicile Creating own designs Designing various models Experimenting for fun Trying to make a successful domicile Describing undesired results Continuing to create new designs Experimenting with locations, habitats Describing purpose of research Covering a wide variety of situations Trying to see what works	“In 2014, last year, I placed the bumble bee booster domicile box. I also created a number of homemade boxes that I just made of all kinds of various random designs and materials just for fun, to create some variety. And try to tempt the bees to use all the boxes for nesting. However, I wasn't too successful. I didn't get any volunteers to occupy the boxes last year.” “This coming year, I just continually make a hobby out of creating all kinds of new, various, unusual designs and put in locations in different habitats. I guess that's the purpose of research, just to cover a wide variety of situations to see what works. I hope I have better success this summer with attracting bumble bees.”	Research participants are employing various practices associated with science inquiry (or scientific method) in order to try to investigate the problem of designing a successful domicile design or obtaining an answer to unexpected (trying to explain why monarch eggs didn't hatch). Research participants use observations they make in the field to plan or design domicile designs and test out ideas. Ellen noticed bees around her Rose of Sharon, along with sun exposure and so has moved the domicile to test this. Charles has only ever observed bees nesting underground and reflects nests he has come across in his own domicile designs that are “surplus” to the project's design. Anne noticed no bee activity in their initial location and
Carolyn		“One time I found this whole big mess	

	<p>Collecting lady bug pupae for observation</p> <p>Getting unexpected, surprising results</p> <p>Witnessing parasitic wasps in monarch eggs</p> <p>Watching one thing and learning about another</p> <p>Concentrating on bumble bees</p> <p>Uncovering wild bumble bee nests</p> <p>Adjusting location of domicile based on observations</p> <p>Seeding domicile with pieces of wild bumble bee nest</p> <p>Predicting that bumble bees will nest</p>	<p>of them [lady bug pupae], brought them in and I thought "Oh well now I can just see what comes out." Instead of the lady bug it was the parasitic wasp and then I got into that for a while (laughter). <i>Trichogramma</i> wasps came out of one of my monarch eggs one time. It's just fascinating because you start watching one thing and then you learn about another and so, now it's bumble bees for the last few years. I just love them. And, I found a couple of nests last year I did uncover a bumble bee nest and it wasn't near where my box was so... I did move my box. I had put it right out in what I thought the perfect area, but then once we found that nest there, I put it pretty close and now I have some of the nesting materials from <i>that</i> nest in my domicile and so I'm thinking maybe this year they'll come see it (laughter)."</p>	<p>moved the domicile to amore bee-active location. Her domicile was also painted blue because she felt that they hid the domicile last year and wanted to increase it's visibility. Carolyn has also moved her domicile to a more bee-visible location and even seeded the domicile with an old bumble bee nest that she found (she did not explain WHY she did this, though it may be from suggestions made in our Bumble Boosters publication).</p> <p>Research participants are saying that they enjoy experimenting and learning and trying to find out more and trying to make a successful design. In Anne, Carolyn and Charles cases, they say they have always been interested in animals or nature or bees in particular. The Bumble Boosters program gave them an opportunity to concentrate on bumble bees in particular. While they are involved in employing scientific practices, they are curious about coming up with a successful design. Despite reporting that they got no occupants, they are still trying again this year and are modifying their locations or the domiciles to try to improve their chances.</p>
<p>Anne</p>	<p>Receiving and constructing materials</p> <p>Determining where to place domicile</p> <p>Observing domicile for inhabitants</p>	<p>"Well, we asked for a kit and we put the kit together and my husband and I decided where on our property we would place the domicile and we would check it every now and then to see if there was any inhabitant.</p>	<p>This shows that these actions and an innate understanding of basic scientific methods are already present in some citizen scientists.</p>

	<p>Describing unexpected (undesired) results Adjusting location based on results Explaining initial set up</p> <p>Explaining undesired results</p> <p>Valuing failure as source of enlightenment</p> <p>Analyzing failure of domicile</p>	<p>Unfortunately, we didn't get any. But this year we're going to try another location that may have more success.” “we have <i>Pachysandra</i> in that area, we have mulberry and we thought that that might be a good place for it but we might have placed it too late in the season.” “I think I'm more aware of the fact that sometimes our failures are an enlightenment.” “You know, it [failure of domicile] gave us food for thought. We put it under briar bushes and buried it under leaves and we hid it and we expected a poor bee to find it (laughter).”</p>	
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Tentative Categories: Having “second thoughts” about insects			
Research Participant	Initial codes (Gerund-based)	Transcript Quotes	Early Memo
Ellen	Noticing bee activity in flowers	<p>“...it's like Grand Central Bee Station.”</p> <p>“there's all kinds of different little bodies that I wouldn't recognize but they're just humming around in those Rose of Sharon”</p> <p>“It's like they're there. Like bees, they're there and they're just keeping the ecosystem going.”</p> <p>“...they're God's creatures and they're amazing.”</p> <p>“That if there weren't bees, bees doing pollination... I just never thought. Cus I just go to the store and I (laughter) don't think about bees.”</p> <p>“So now you think about a bee, what a bee is pollinating... And that's pretty good.”</p> <p>“You see a mosquito, you swat it. Flies, you swat them. Now I have a second thought and I'll really look at a bee and I never really hit bees cus I told you I got stung. But there's a little more respect for a bee. So I'll watch them, like in the morning and in the summer, they come on the deck because the sun is there and they kind of buzz around.”</p>	<p>Previously: Acquiring a new interest in bumble bees (but second thoughts applied to other bees and insects</p> <p>Having second thoughts about insets means taking a moment to examine insects, rather than just seeing them as pests and swatting them. Research participants take a moment to “really look” at the insect, to observe them with “a little more interest” and in some cases even admiration “Oh! Well, that's a nice moth!”</p> <p>In the case of Anne and Ellen, they reported a newer interest in insects and acquiring an interest through me. In Anne's case this was years ago. Ellen even says that “bumble bees are not my love” and describes a couple of painful interactions she had with bumble bees (or some other stinging hymenopteran) growing up and</p>
	Discovering diversity of insects		
	Recognizing bees' existence		
	Recognizing bees' ecological value		
	Valuing bees		
	Realizing connection between food and bees		
	Connecting food in stores and bees		
	Connecting bees and pollination in a positive way		
	Killing mosquitoes and flies		
	Having a second thought about a bee		
Letting bees alone			
Having more respect for a bee			
Watching bees			
Charles			

<p>Carolyn</p>	<p>Hating roaches and flies Being disgusted by flies</p> <p>Seeing flies as beneficial as bees Opening up my eyes to benefits</p> <p>Recognizing interactions of insects Loving insects more</p> <p>Losing disgust for roaches Recognizing ecological value of roaches</p> <p>Researching unknown animals</p> <p>Finding out it's name Getting acquainted through knowledge Hating "pest" insects less</p>	<p>"We moved from a place where of course, I hated roaches and I hated flies. Flies were so disgusting to me and then I came here and now flies are as beneficial to, as bees. I see now that flies aren't just houseflies. So it just opened up my eyes to what everything really is and how beneficial they are to us and how they all play a part together and so I love them more now (Laughter). And everything. When I overturn a log in the woods and see a roach I'm not disgusted by that. Now I see that as just part of the, they're little decomposers. They're just doing their job and they're not coming in my house. (Laughter)"</p> <p>"I take a picture of it, if it's something I've never seen and I look it up, find out what it's name is and then once you know it's name, you come acquainted with it (laughter) and then you're like "Ok. You don't hate it this much.""</p>	<p>with her own children. Both discuss a new awareness and appreciation for the diversity of insects and the ways that we (humans) rely on pollinators. Anne says "As your interest increased in that area (bumble bees), so did mine. I was interested in the work that you were doing an it just seemed a natural step to take, to be involved as well." Ellen says "</p> <p>Even in the case of Charles and Carolyn, who both had a long-term interest in insects, they joined the Bumble Boosters program because of a new interest in bumble bees in particular. Charles says " I was introduced to the bumble bee program a year or so back through Dr. Golick. I've watched his work over the years with honey bees...I have always found his work interesting as I have been involved with honey bees for most of my life...And I just got involved with the bumble bee booster project."</p>
<p>Anne</p>		<p>"As a housekeeper, they [insects] were pest. Now I look at them with a little more interest to observe the kind of movement they have and I look at what they are exactly."</p> <p>"It was something to be gotten rid of, you know? And now it'll be "Oh! Well, that's a nice moth." (Laughter) I'll flip a paper under them and kind of give them the boot, so to</p>	

		<p>speaking, but I'm not squishing them like I used to.</p>	
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Tentative Categories: Assuming the role of expert

Research Participant	Initial codes (Gerund-based)	Transcript Quotes	Early Memo
Ellen			
Charles			
Carolyn	<p>Becoming an entomologist to peers</p> <p>Needing to share acquired knowledge</p>	<p>"I'm considered their entomologist (laughter)."</p> <p>"Now I <i>do</i> feel like my knowledge, I need to share it...now they'll say 'Go talk to Mrs. Jones. Go ask her, she'll know.' So they see me as a kind of a bug, a bird expert."</p> <p>"Now I just really think of my self as a scientist. And that anybody who's interested in learning these things can learn them and study them, and research."</p>	
Anne		<p>"They yelled for <i>me</i> to come and take care of it (laughter). I would have never been the one to be called."</p>	

Tentative Categories: Finding satisfaction in “being involved at a higher level”

Research Participant	Initial codes (Gerund-based)	Transcript Quotes	Early Memo (Consolidated)
Ellen	Enjoying usefulness of participation Enjoying novelty of participation Participating to help advance science	“...that I'm doing something useful. Something I would've never thought to do by myself. Useful for the science. Useful to give feedback of what's going on in my yard.”	
Charles	Supporting science for a long time Getting more involved through program <i>Defining ‘getting involved at a higher level’</i> Creating and doing authentic research Hoping for successful outcome	“I'm pretty much in support of that [science] originally. It's [Bumble Boosters] probably gotten me more involved at a higher level . “Rather than just casually observing something I like, we're participating and actually creating the domiciles to do some kind of research that would hopefully come up with some kind of result, hopefully it's a positive result.”	
Carolyn	Enjoying learning about project topic Sharing knowledge	“I enjoy learning about it (project topic) and I love to tell my kids...how much I learn because they are so into it, too. Anything that we study. ”	
Anne	Exciting to impact academic institutions, policy makers and community Enjoying authenticity of research Hoping for successful impact Enjoying “the involvement” Enjoying participation in the search for	“It's <i>exciting</i> to be involved with it...because it is being involved in academia and research <i>right</i> now that will map future attitudes and future actions and hopefully set policies.” “The involvement. It's just <i>so</i> exciting to be involved in <i>searching</i> for a way	

	<p>ways to help bumble bees</p> <p>Emphasizing involvement in authentic research</p> <p>Feeling excited to add to science knowledge</p>	<p>to advance bumble bees.”</p> <p>“The fact that I am not in graduate work. I'm not working for a doctorate. And yet I <i>can</i> do something to add to our foundation of knowledge. That to me is very exciting, that I can participate and you know, observe and send those observations and that they can be used.”</p>	
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Tentative Categories: Captivating a surprised public through every day conversation

Research Participant	Initial codes (Gerund-based)	Transcript Quotes	Early Memo
Ellen	Interacting with husband Mentioning it to daughter, negative response Not mentioning it to neighbors	“Well of course, my husband is here with me, so he was into it as well.” “I mentioned it to one of my daughters and they just rolled their eyes in their heads.” “The neighbors - no, I never really thought to tell anything to the neighbors ...They kind of keep to themselves.”	Previously “interacting” – but there’s more to what they’re doing. The research participants report interactions in which people they are talking to about the project are surprised, or shocked at the idea of a bumble bee citizen science project yet, to the pleasure of the research participants, these same people will discuss and want to know more about the project at length. Assessing public perceptions of insects “Assessing” may not be the right word. They are evaluating the surprise and ensuing These citizen scientists (all 4 of them) see a difference in “others”,
Charles	Discussing bees in chance conversations; Being met with surprise Being questions about project Discussing project at length Detecting interest in others	“people have asked me about them (domiciles). So I've had a chance ... visit with people and they'll look at you kind of funny.” “Why are you in a project like that?” And they'll spend a half an hour talking to you describing (laughter). Every body's interested once they observe what you're doing. And they like to learn more about it.” “It's always interesting to me how	

	<p>Mentioning bees to others</p> <p>Detecting negative response to bees; Discussing bees for a while unexpectedly</p> <p>Detecting interest in others</p> <p>Changing others opinions about bees</p> <p>Changing others' attitudes to tolerance and curiosity</p> <p>Noticing that others observe and share their observations with me</p> <p>Detecting new positive attitude and desire to discuss in others</p>	<p>when you mention bees, every body looks at you like they have some kind of a negative response to it. But yet, they'll stand there for half an hour or an hour... (Laughter)."</p> <p>"You know, everybody's interested if they would recognize what they're (bees) doing rather than just say "I don't like bees". But they all have an interest in it. And I have changed uh a number of people's opinions after I explain to them the project and, changed their attitudes to more tolerance and curiosity..."</p> <p>"Finding they'll start observing and casually see them somewhere. They'll comment on what they've seen last week or something like that so they actually take a positive attitude and find an interesting discussion point."</p>	<p>whether they saw it in themselves at first or not. They find it interesting that people respond in awe, shock, that they are involved with bees and also find that people, despite their initial reaction, are interested in hearing more. All 4 research participants note that they feel there is a lacking understanding or appreciation of bees in general, by the public. I coined this as "assessing public perceptions of insects" – maybe something to revisit. Despite this assessment, three of them (excluding Ellen) have a sort of "shared experience "reported having quite lengthy conversations with people who were initially surprised or shocked by their involvement in the program.</p> <p>This is an important category for me. Because I think this is really where the impact is occurring, though not necessarily something that can be captured quantitatively using</p>
Carolyn	<p>Detecting interest in teachers</p> <p>Sharing</p>	<p>"...so all of the teachers were fascinated by that. They didn't know that there was anything more than just one. ... they see us doing something and they're like, 'Hey out there!' And then, I'll show them what we've done"</p>	
Anne	<p>Discussing project at work</p>	<p>"In the teachers' room, and over lunch we would discuss your work and what I did in order to be part of</p>	

	Detecting surprise/interest in others	it. And you know, people, teachers were open to it. Again, they were not, let me think...their attitude was one again, of surprise and "Isn't that interesting" you know that you could be involved in something like that. And yet, you know what, any time someone steps out of the mold, so to speak, it is interesting to parties whether or not they do participate or not."	instruments
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