



- » JAAACS Home
- » Article Archive
- » Editorial Statement
- » Call for Manuscripts
- » Author Guidelines
- » Editorial Board
- » Review Board

- » Submit An Article
- » Contact JAAACS

Volume 6

February 2010

## ***Not All Science is for Brilliant Minds and Boring People***

Lina Kralina, Ph.D.  
University of Missouri-St. Louis

---

Curriculum standards present educators with content to teach but attitude or readiness to learn are not as frequently addressed. Learning occurs everywhere, from formal classroom instruction to informal outside-of-school activities, encompassing a wide range of experiences and benefits. Extracurricular activities (ECA) generally offer students free-choice experiences that are voluntary, open-ended, non-sequential, self-directed, hands-on, and evaluation-free. Thus, ECA offer an additional venue to provide opportunities for engaging students in science and allowing them to explore different perspectives, attitudes, social positions, and trajectories of identification.

Social interactionism asserts that “reality for people is based on the meanings and interpretations that they have given social processes of people interacting” (Blumer, 1969, p. 5). Everyone is a part of reality and its changing nature, so there are multiple interpretations of reality. By building an understanding of these interpretations within their retrospective settings, overarching concepts based on those interpretations come together to form a cohesive theory of reality (Shank, 2006). By examining the social settings and the individuals in those settings, investigators discover “how people arrange themselves and how individuals make sense of their surroundings through symbols, rituals, social structures and social roles” (Berg, 2004, p. 7). Simply, what people do and say is the result of how they have interpreted their social world. Just as meaning is conferred on objects and events, then the memories of former club members reveal how they interpreted and made sense of what they experienced and that perception is what the reality of the club was to them. Thus, perception is reality (Thomas & Swaine, 1928). Although subjective and personal, these beliefs shape who the individuals are and allow them to go confidently into the world as if those beliefs actually are real. So, to understand the behaviors of people, researchers must first understand the definitions, meanings and processes by which they are formed and accurately record observations, all the while realizing that the memories of the researcher affect the analysis as well. In collecting and analyzing memories of these perceived realities, the phenomenological challenge will be to “interpret these beliefs without creating new realities, without imposing the researcher’s perceived reality, and

without making the results of the research align with self-imposed dictates” (Shank, 2006, p. 83).

My position is that this ECA enhanced attitudes toward science and thus, learning. This study collected the memories of adults who participated as adolescents in a high school science ECA, “Suzy Science and the Whiz Kids©” (SSWK) for their perceptions about the nature of their participation in SSWK. Their perceptions and the meanings applied to these experiences represent reality to them now, about what they think occurred in their past and as such, these perceptions form the basis for their subsequent actions and responses to the reality as they knew it. The composite of their recollections and perceptions allows the reconstruction of the reality of what it meant to be a member of SSWK.

Perceptions stated by these adult former members may differ from the perceptions they would have voiced as teenagers. What they value now may not be what they valued then as club members. Not all members had the same experiences in the club, even if they were members the same school year. Not all important memories may have surfaced, so this study is limited to the responses received from these participants. Frequency counts are not intended to convey higher importance, just higher rates of occurrence. What others say they have observed/experienced and what I have observed/experienced comprise the reality in which we interacted. The actual reality lies somewhere in between these shared interpretations, but the composite of these multiple realities defines authentic understandings and prevalent meanings that can be forged together to form a theoretical framework that constitutes the reality of being a member of this science ECA, what it meant to them in their lives then and now. Lacking experimental controls, the generalizability of this study applies only to the population from which the sample was drawn and not to all high school ECA populations. It is left to the readers to compare situations, imagine the possibilities, and determine the extent, if any, for applicability of these findings to programs for their own students.

### ***Comparison of SSWK and Related Literature***

The basic structure and operation of SSWK was first examined compared to the related literature. SSWK showed remarkable correlations with the studies reviewed and thus, serves as a viable vehicle for study. To establish the etic perspective of this study (Chenail, 1995), I am the sole creator and sponsor of SSWK (copyrighted). The concepts of teenagers dressed in costumes teaching young children came from my experiences as Director in Children’s Church. A large group of students working collectively in smaller squads came from my work with squads as a Girl Scout leader. A hands-on approach came from my experiences as a science teacher. The incentive came from my seven-year-old daughter wanting more hands-on activities in her science class at school. It is rewarding to find that many SSWK precepts established at its creation have been validated in subsequent research studies. However, contradictions in the literature exist as well because SSWK was a unique science ECA compared to typical secondary science ECA with respect to two characteristics: 1) the club’s mission was not competitive, but collaborative and service-oriented; and 2) members wore costumes and assumed roles as science ‘experts’ and teachers while performing demonstrations for elementary children.

Study participants were former members of SSWK. The club

was offered ten years at a large middle-lower-socioeconomic public high school and another four years, at a small private upper-socioeconomic high school, both in the suburbs of a large Midwestern city. Dressed in colorful costumes, high school students visited local elementary schools and presented science demonstrations to the children. Elementary children were encouraged to assist with the demonstrations and Whiz Kids were trained in ways to engage all the children in presentations. SSWK was also invited to present at local science festivals and fairs, PTA events, Scout celebrations, and national events, such as National Chemistry Week.

Students joined SSWK based on the year they took chemistry. Both schools required students to be concurrently enrolled in, or have successfully completed a chemistry course. This ensured that all participants had passed essential safety tests and that all members and their parents had signed school safety contracts. Students were also required to have passing grade point averages (GPAs) as prerequisites for participation in any club program, a typical ECA practice, but decried as being too restrictive (McNeal, 1999). Students were asked their preferences for squads, science topics or demonstrations, and friends. They were placed into squads deliberately organized and balanced to ensure that each one had a female, a male, a strong science student, a non-Caucasian student, and an outgoing student. This insured that each squad had the widest possible representation so every child in their audiences saw someone in the squad with whom they could identify. Students typically joined the club in their junior year and were members of the club for 2 years and longevity increases the benefits of ECA participation (Simpkins, Ripke, Huston & Eccles, 2005). No one was turned away because they could not afford a costume, demonstrating elasticity and flexibility not usually found in large high schools (Crosnoe, Johnson & Elder, 2004). The sponsor actively recruited some students to join (Guest & Schneider, 2003). These students were recruited to help build up their poor self-esteem and/or underachievement in science (Powell, 2004; Reis, Colbert, & Hebert, 2005). Students were also encouraged to join, hoping it would help develop aptitudes or skills in science, leadership, teaching and human potentials (Silliker & Quirk, 1997).

Whiz Kids chose from a variety of colorful, cheery costumes and applied make-up to assume new identities (Bakhtin, 1965). Costumes encouraged role-play, positioning them to become 'science experts' for elementary school children. During role-play, students had opportunities to explore new identities and test the 'fit' of the values of those identities, e.g., identities in science and teaching (Guest & Schneider, 2003; Pinciotti, 1993; Powell, 2004). Members prepared demonstrations with the teacher during separate squad meetings (Murphy & Whitelegg, 2006). Working in small groups with the teacher offered students the opportunity to develop personal relationships with an adult supervisor outside the classroom (Broh, 2002; Reis, Colbert & Hebert, 2005). Whiz Kids learned to present demonstrations skillfully to elementary school children (Voegel, Quashnock & Heil, 2004). Each squad focused on specific physical science topics, contrary to documented preferences of females for life science over physical science topics (Lawton & Bordens, 1995). Students practiced working as a group to enter and assume control of classrooms, i.e., 'door-rushing,' as well as supporting peers (Cushman, 2006; Darling, Caldwell & Smith, 2005) from uncooperative, disruptive children during presentations, i.e., 'riot control.'

SSWK offered clear organization (Broh, 2002; Guest & Schneider, 2003). Over 20% of the members held leadership roles one or more years. Suzy Science contacted her squad leaders who, in turn, kept their members informed of practices and performances, building social networks of Whiz Kids (Darling, Caldwell & Smith, 2005; Guest & Schneider, 2003). Squad positions offered leadership skills and responsibilities to students, particularly females (Wanlass, 2000). The teacher served as elementary school contact, met with faculty members, and arranged schedules and visits. PTAs provided transportation and lunches. Whiz Kids performed demonstrations in individual classrooms by squads. Children wrote fan mail to their favorite characters, describing what they learned or liked about their presentations. This 'fan mail' likely offered significant, positive reinforcement and increased self-esteem for high school students in their roles as science teachers (Cushman, 2006). The teacher monitored presentations regularly to insure safety, science accuracy, and good presentation skills (Munro & Elsom, 2000). ECA participation is effective in predicting future volunteer service (Janoski, Musick & Wilson, 1998) and SSWK was based on service learning.

### ***Study Procedures***

This retrospective study of SSWK has the feeling of returning to Lerner and Lowe's (1954) "Brigadoon," a mythical land that appears once in a lifetime and then disappears into the mists of time. Reconstructing relationships, interactions and feelings are based on memories that have mellowed, but have also grown dim with the passage of time. The limitations of this study are due to the obvious bias and interaction of this researcher as club sponsor and of the participating adults as former club members. The reader is charged to use the vision from the lantern (Shank, 2006) as well as the sounds and images from the small voices of yesterday's teenagers in search for identity and significant relationships, not only within their small circle of friends, but also with peers beyond their immediate social group, with their parents and teachers, and within their school. The mists of time through which these visions and voices are transmitted may obscure some aspects, just as cataracts in old age tend to blur images. Looking and listening for the underlying concerns, dreams and values in the small voices of teenagers lurking beneath conversations of the adults they have become enables readers to recognize meaningful learning and changes in perceptions that fostered growth and development of self-identity.

Original high school club rosters were the starting point in locating the current whereabouts of former members and were supplemented with snowball sampling. Members' families had moved from initial neighborhoods and alumni pages showed most females changed their names when married. All club members had completed high school, averaging 16 years since graduation. Most had completed additional educational training and were middle-aged (ages range from an estimated 30-45 years). Many were married with children and living at locations including Alaska, Australia and Thailand, far removed from their high school family homes. Only 115 of the 352 former active members were located and 92 individuals (80% of those located) completed the survey (on average, in 13 minutes) and 18 were interviewed (in 57 minutes on average). Although posted anonymously, survey responses specifying graduation, characters and specific incidents made positive identification possible, considering each year members had unique characters/costumes. Study sample included 61 females and 31

males, 62 public and 30 private school members with 76 Caucasians and 16 non-Caucasians. In all, 33 were members for one year, 52 for two years, and 7 for three years, averaging 1.7 years. Study sample and non-responders exhibited the same relative composition as the overall membership with respect to school, gender, ethnicity and longevity. Thus this was a representative sample with no non-responder bias. Responses were coded, tabulated, and tested for validity and reliability. Sample quotes illustrate data interpretations although no voices dominate. Numbers in parentheses after quotes refer to survey respondents; those preceded by "I" indicate interview respondents. Bracketed information clarifies quotes. Conversations flowed easily as if it were only yesterday when we last talked, simply picking up where we left off, albeit 10-25 years ago. Visiting with former students has been like finding "Brigadoon" again, in the mists of time.

### ***Study Findings***

Years after participating in SSWK as adolescents, adults offered insightful responses regarding their feelings and the interpretations of their SSWK experiences. They discussed why they joined the club, what it meant to belong to the club then as adolescents, and what it still means to them as adults to have belonged to this high school club.

### **Reasons Why They Joined SSWK**

Feelings were paramount in responses, particularly reasons given for joining SSWK. Notably, 2/3 of this science ECA reported joining for reasons other than interest in science. They joined for fun, belonging, and teacher influence. Even more significant is the fact that students joined *despite* prior academic interests, attributes, and club activities.

The major reason cited for joining was that SSWK 'sounded like fun': "It was fun, it was social. . . I was there because it was fun, at the time. That's the bottom line!" (I-6) 'Fun' in SSWK was mentioned 130 times. Contrary to literature reviewed, no respondent reported joining to improve public speaking, meet personal needs, seek academic challenges, prepare for careers, or learn time management. In sharp contrast to the literature regarding science ECA, no respondents reported joining due to teacher coercion, course requirements, or parent intervention: "I'd wanted to be a member since grade school. I always liked it when they [SSWK] came to my school when I was little, and so I grew up wanting to be a part of it." (68) Many joined based on their interests in science or in working with children. But it was the sense of 'fun' that caused enrollment to snowball: "The project drew in fun personalities and that had a positive effect overall since, as more fun people joined, then more others heard about it and they also wanted to join to bring their fun personalities into the group." (22) Regardless of the grade level at which they joined, 80% remained members for the remaining years in high school.

Besides fun, 18% joined SSWK just to belong to a group. When asked what they liked best about SSWK, 44% responded that they felt they belonged; they liked feeling like they were a part of a group. Many reported that the influence of friends persuaded them to join the club: "I was a pretty shy and insecure adolescent. My friend Nelly of the Nile convinced me to join because she didn't want to do it alone. I'm glad she did, I became Pammy Pumpkin." (14) Former

Whiz Kids described the sense of community they felt within the club: "Loved being part of such a fun group of people!" (58) Non-Caucasians reported the most increased sense of belonging. Members with increasing longevity reported greater connectivity within SSWK. Females reported greater sense of belonging than males; public school more so than private school members. Adult respondents recalled their perceptions about belonging and its importance to them as adolescents: "I belonged to a group and had a great time. I just wish I had joined earlier." (10) Belonging elicited strong emotions:

We laughed a lot. We had a good time and enjoyed each other's company. The club was a good way to get me out of the general high school population and spend more time with my real friends that I didn't see that much during the day. This club was one of the few bright lights in my overall terrible high school experience. (24)

Besides fun and belonging, respondents perceived joining SSWK due to teacher influence. Despite the lack of any specific questions regarding the teacher, 75% of respondents described the teacher as being influential in their participation and 59% commented on the personal relationship they felt with their teacher/sponsor. Many mentioned that they still had notes sent to them 10-25 years ago: "I remember and still have the notes from students and you. You would send us the school fundraiser telegrams and I still have those." (21) Responses showed 26% made references to me in general ('the teacher'): "The teacher (club advisor) was the teacher that had the greatest impact on me; she still is what I reference in my head when I look for effective teaching practices," (63) Another 49% made references to me by name: "Completely unrelated to science, [Author] was an empathetic teacher that cared about her students in ways that were greater than anything we could learn in school. She had a profound effect on my life after a close friend's father died and I always appreciated the time she took to help me." (16) Younger new members cited more interactions or identified more with the teacher than did older new members. Interactions with the teacher were described, perhaps valued more on an individual basis (63%): "I remember [Author] helping me with the science demonstration," (9) than in interactions within groups (37%): "We worked with our science teacher who suggested different experiments we could do." (86)

Twice as many females as males reported joining SSWK because they liked the sponsor, but twice as many males as females reported being invited by the sponsor to join the club: "[Author], she was a very dynamic instructor. . . She was the instructor I wanted to someday emulate. She never gave up on me no matter how much I struggled! I wanted to help her get the club going." (5, female) More Caucasians reported joining SSWK because they liked the sponsor, but more non-Caucasians reported being invited by the sponsor to join the club. Twice as many public school as private school respondents reported joining SSWK because they liked the sponsor, but the same percentage at each school reported being invited by the sponsor to join SSWK. Twice as many three-year as one-year members reported joining SSWK because they liked the sponsor. No three-year, but 18% of one-year members cited being invited by the sponsor to join SSWK. Respondents who were members the longest cited the teacher as the reason for joining and what they liked best

about SSWK. However, respondents indicating stronger teacher bonding were not necessarily those with more club longevity: “[What I liked best was] Our teacher, [Author]. I wanted to be in any club that she had going on!” (3, sophomore entry, last year at this school)

While members joined for fun, fellowship and teacher influence, respondents also perceived joining SSWK *in spite of* any prior academic or club interests or personal attributes. First, respondents expressed many ambivalent feelings about joining a science ECA as adolescents: “I wanted to do what my friends wanted to do. They told me about this cool Science club, and I wasn't good at Science. They said it didn't matter. I was worried that the teacher would tell me no, because Science wasn't my thing. But the whole experience was very inclusive, and I learned quite a bit.” (45) Noteworthy, 29% reported aversion or no interest in science prior to joining SSWK: “I HATED science, especially biology! All we ever did was just book work! I got an A in chemistry, but I hated it!” (I-1) Parents questioned such contradictory behavior: “My mom was surprised I wanted to do it [SSWK] because I never liked science, but I enjoyed being one of the Whiz Kids.” (66) Females expressed aversion to science: “Can't say I'm much of a science fan,” (82) and “I was an honor student and it was intimidating to have something that I felt was over my head. (I-7) Males echoed similar hesitations: “Frankly, I was never particularly interested in science,” (78) and “Many of the activities involved chemistry or physics, which were weaker areas for me than biology.” (65)

Besides aversion to science, contradictions included 14% joining a club focused on public performances who reported being shy: “Loved it – wouldn't have done it without costume. I am introverted - costume allowed me to perform.” (57) and “I was a shy individual in high school and kept to myself most of the time. The club allowed me to open-up and learn to teach others.” (81)

Non-science and shy individuals didn't fit the mold for a performing science club, but neither did the non-theatrical types who expressed concern or shock about wearing costumes. Only 6% indicated any prior theatrical involvement. Many reported having to overcome their self-consciousness about wearing costumes:

- I didn't [want to join]! I was too afraid of "dressing up" and being made fun of, but someone ([name]) said I had to and so I did. I was given the "French Maid" costume and everyone was surprised that I looked alright in the costume (mostly myself I think). (12)
- Personally, I hated the clown costume. (7)
- I still laugh at the thought of me as a butterfly. (27)
- It was a challenge to get up there and be serious, especially when you were watching your friends perform, when all you really wanted to do was giggle at the whole situation. (22)

Thus, SSWK members joined for a variety of reasons. Students were looking for fun, seeking a place to belong, and were interested in science or working with children. There were also reticent, reluctant ones enlisted by the teacher as well as the non-science, non-gregarious, and non-theatrical students. It wasn't to get out of classes:

Why on earth would a high school student dress up in a

funny costume to go teach elementary school kids about science when they could stay behind and hang out with their friends, stare longingly at the cute blonde in the front row of econ class -- you know, the one who smells sooo good and, ohmygod, did I tell you she said hi to me the other day -- and be absorbed by all of the things that high schoolers are absorbed by? I mean honestly, I don't think that many of the Whiz Kids just wanted to get out of classes. (78)

The club was an interesting mix of the usual social 'cliques:' "There were different students, athletes, band members, thespians, scholars, we were somewhat eclectic, but all enjoyed working together." (21)

### **What It Meant to Belong to the Club then as Adolescents**

Respondents also discussed what it meant to them to belong to SSWK. Their realities centered on making new friends, trying new identities, discovering things about science, discovering things about themselves, and finding club activities very rewarding.

Former Whiz Kids cited initially joining the club because friends joined or wanted them to join, but respondents made more references to new friends they made or club members in general rather than specific mention of particular entry-level friends. Responses showed a ratio of 2:1, with 111 responses about new friends in the club versus 51 comments about friends. The lantern illuminates their comments about making new friends in light of the formulation of the squads to promote equity:

- We cooperated so well that we became friends. (32)
- Developing strong relationships with the other members of the club helped me throughout my high school years. (34)

They learned to work with other people, including those at different grade levels:

- It was learning experience all-around. We were learning about the program as well as how to work together. An open mind and line of communication across all team members worked really well. (37)
- There were kids from all 4 grade levels in one group, which gave us the opportunity to teach & learn from each other. (67)

In addition to making new friends, students felt being a part of the club allowed them to try different identities, first by being part of a science group: "Looking back that was a great science club because it was fun, social, and not stereotypical "dorky" science club." (14) First, even though nearly 1/3 acknowledged that they did not like science, respondents uniformly asserted that every member in SSWK loved science:

- I liked the comradery we formed as a group - 3 different grade levels and we all excelled in science. To other groups we might have been the "nerds," but together we had fun. (8)
- [SSWK] affirmed my already positive attitude toward science in that others in my school thought like I did: it's OK to be smart and learn. Let's face it, until the Science Channel came



on the air, there were no role models on TV for science/ math junkies. It's all about athletes and popularity. The club "let us be us". (61)

It appears as if no one told anyone else of his/her apprehensions or fears of science. Perhaps they all accepted the Thought for The Day on the chalkboard by Robert Stevenson, "Keep your fears to yourself, but share your courage."

Wearing costumes allowed members to try different identities; people who get attention, members of a community, super-heroes, outgoing people, and science 'experts' or teachers. They could become people who got attention. Private school and non-Caucasian members were 25% more likely than their counterparts to recognize the value of costumes in getting children's attention. More males than females noted the attention-getting qualities of the costumes. Longevity also increased this awareness. Females expressed more interest in teaching, but made fewer references to costumes for attention-getting. This might be due to their comfort level in working with small children or that costumes were more memorable in the wearing rather than in the attention capability, i.e., more females than males made reference to how they looked in their costumes. Costumes got attention:

- The costumes made us more appealing to the young audiences. (1)
- We probably held the kids attention more with our costumes. We were different, a novelty for the day. (3)

Attired in costumes, SSWK built a sense of community among all the members free of their usual social positions and equally important in such processes as 'door rushing', crowd control, teamwork and peer support. Being equally important and heard by others emerged in survey comments and fostered self-esteem:

- So important for self-esteem! You could "be" someone else and not have to worry about your own standings within the school cliques or what clothes you wore. You could say or do anything with less fear. (12)
- We all clapped and cheered each other on." (85)

Respondents also indicated that costumes made them more approachable and developed community with the children: "Costumes, in my opinion, help create an initial bond with younger students and created an initial atmosphere of comfort. (41) Non-Caucasians adamant that costumes were for attention-getting seldom spoke of costumes for the extra dimension of community that they added, for both the elementary children and the Whiz Kids wearing them. Members with longevity especially recognized the 'user-friendly' factor of costumes:

- The costumes made the presenters entering the classrooms less scary and more approachable I think the kids could focus less on us as strangers and more on the demonstration. (91)
- [Wearing costumes] was the "magic" of the whole program. Without the costumes, kids would have taken more time to warm up to the presenters. (48)

Costumes also gave new identities of more outgoing, not shy people:

- It gave me, a shy person, the chance to 'hide' in a persona or costume while speaking publicly. (70)
- I was an extremely shy gal so doing Suzy Science helped me not hide and be more comfortable around everyone. (83)

Some members perceived that costumes were actually letting them assume different identities with unique ways of relating and behaving. While role-playing, Whiz Kids had the opportunity to assume the values and check the 'fit' of being science 'experts' or teachers, with longevity members definitely embracing this perception:

- There was also something to be said for high school students using that change of costume to step into a role of a scientist. (2)
- It was a way for the high school students to be leaders and grow their self esteem as scientists. (32)
- It [Costumes] lent some authority to what we said, even though we were just a few years older than them. (61)

In addition to making new friends and trying new identities, respondents perceived that belonging to the club included discovering things about science. According to 84%, SSWK participation improved their attitudes about science, with 65% reporting significant positive improvements, especially by private school members:

- It made me enjoy science which I did not enjoy previously. I still remember many of the experiments & told my kids about how fun science can be. (25)
- Because I'm not really a "science" person. I don't think I would have tried some of the things, if it wasn't for Suzy Science. (51)

Changing attitudes about science also produced perceived gains in science content knowledge: "I loved being with the group. We would practice our demonstrations for each other to see if we were doing it right and to see if we could answer the questions our audience might have." (35) Respondents cited mastering content and challenges: "As I was able to comprehend the principles behind experiments as well as explain them appropriately, I was given more difficult experiments to perform." (23) Overall, 81% of respondents perceived that their knowledge of science increased by participating in SSWK, and in some instances, their continued enrollment in science courses: "I went on to take more science in college and got A's in chemistry. I was well prepared with what I learned in high school." (86) SSWK offered valuable science learning experiences: "Definitely a new spin on how to think about science and how to get kids interested in science," (40) and "It gave me a more practical understanding of the chemicals around me everyday vs. the ones in the lab." (50)

Another perceived reality is that being members of SSWK, respondents felt they had also learned new things about themselves. They experienced growth and development of important talents and attributes; e.g., attitudes, confidence, enthusiasm, public speaking, and social interaction skills:

- It showed that even the most difficult subjects could be learned if you have a good attitude and put the time into it.

(74)

- I definitely grew more confident in my communication skills and became a better presenter, as far as speaking clearly and with enthusiasm and learning how to involve the students in a meaningful way. (19)
- We learned a lot more than just science in those visits. How to deal with public speaking, how to deal with people participating to little or too much, how to work well in a group. (82)

Finally, respondents recalled that belonging to SSWK was rewarding, giving something back to their community:

- I just had a great time with the other students, having fun and teaching the young kids about science. It was a very rewarding experience. Outside of athletics, it[SSWK] was one of the best experiences from high school. (48)
- It [SSWK] made me feel like I was positively impacting a younger student and it made me feel good. (44)

Adult respondents applied meanings and interpretations to their experiences in SSWK as adolescents. In addition to why they joined the club, they unpacked the essential elements of what it meant to belong to the club then as adolescents. Their realities evolved around new friends, new identities, discoveries about science and themselves, and rewarding experiences.

### **What Belonging to SSWK Years Ago Means to Them as Adults Now**

Respondents framed a reality around their experiences in SSWK to give meaning and direction to their lives then and now. The interpretations of their experiences shape who they have become: “Somewhat helped shape who I am today.” (69) Overall, they made 161 comments regarding their future self-images, where they saw themselves going from those experiences years ago. Respondents shared their insights of these meanings through their increased awareness of science, enhanced educational opportunities and career aspirations, and adult volunteerism.

While “Brigadoon” exists only on an island in time, SSWK definitely impacted these respondents during high school and remains with them now in their future. Its educational precepts have been promoted in other venues by former club members and even by their parents. One former member became a chemistry teacher and started her own SSWK club: “I held [*sic* - sponsored] the club myself knowing what it can offer both k-6 and high school.” (69) Some remnants are alive today in educational settings:

- I have shared my experiences with my daughter who is now in high school chemistry. We've talked about starting up a club in her high school and have been exploring the necessary steps in making it happen. (52)
- I have mentioned it to my students when I teach. In fact, I have also recommended that our math club do something similar when I co-sponsored math club. (81)

Poignant memories spurred some to take their learning and apply it

in the business sector:

- I've used the Lego experiment in my office retreats, to extraordinary reception - the experiment where one person builds something out of Legos and tries to explain how to build the same thing to their partner without visual aide. (41)
- I use it when I am training new trainers - I've had them do the static electricity skit in a Train the Trainer session that was geared towards helping them understand how to effectively present information that could be viewed as dry, and jazz it up into an interactive learning experience. (45)

Sometimes it has been their parents who have incorporated the precepts:

- My mom is an elementary school teacher who has built her entire career on outside-of-the-box thinking when it comes to transferring knowledge. The approach utilized by Suzy Science was right up her alley. (62)
- Years after I graduated, she [my mother] had to write a paper on great educational ideas she'd witnessed and the general concept of Suzy Science that her son had participated in at my school was one of her better examples of how to make something interesting for young students. (22)

This study has the benefit of the actual educational levels attained by former Whiz Kids. Data showed that 100% attended college; 89% of respondents had Bachelor's degrees, 52% had Master's degrees, and 8% had PhDs or equivalents. The high educational levels attained by these adult former Whiz Kids tend to confirm earlier findings that consistent ECA participation 1) allows talented students to achieve at high levels, and 2) is associated with positive changes in educational aspirations and interpersonal competence. Former Whiz Kids referred to educational prospects based on their experiences and interpretations:

- It made me more open to looking at the world with different questions in mind. (8)
- Talking in front of people help me get over my fear of talking in front of people. Helped in making school fun which helped in keeping me motivated in college. (31)

Career aspirations were also enhanced because of SSWK involvement: "Seeing [Author] as a female, as a leader, I'm sure went far to encourage me to do the things that I knew I was capable of." (40) SSWK participation enhanced career aspirations in a) science:

- The experience had a larger effect on my college and professional career in that I have stayed in science (as a practicing engineer) and still enjoy coaching and mentoring our new staff members. (61)
- The club really raised my interest in science and helped me choose nursing as a career. (23)
- It [SSWK] also helped me to excel in my (previous - before kids) profession of being a software developer. I am very proficient at coding, but I was called on regularly to go to the client to help wheedle out what the requirements were because I was technical enough to know what could be done, but

people-oriented enough to get the thoughts and ideas across.  
(8)

b) teaching:

- I became an elementary school teacher. I think that my participation in the club helped me to realize that I wanted to become a teacher because I enjoyed getting up in front of the kids and teaching them about science. (15)
- I went into teaching myself. [Author] made learning fun, and I wanted to share that with others. (10)

and c) other fields:

- I have cases involving forensic evidence, which requires a basic understanding of science, such as DNA, fingerprint comparison, drug weight and mixtures, drug field tests, and intoxication. (20)
- It was great practice for delivering complex information -- teaching is an important part of what I do in the corporate world whether it's through change management strategy, explaining a difficult concept in a meeting, or delivering systems training in a formal classroom - my participation in the club helped me practice some of the techniques that I would later use in business (patience, communication with various groups, breaking concepts down into simple terms, building on past knowledge, etc.) (55)
- Gaining confidence and comfort of presenting to people and learning how to organize information and present the important facts. All of these have helped me in my career. (46)

Learning which careers not to enter is just as important as learning which career a person does want:

- It was a good experience dealing with the elementary school children, but I felt I wasn't quite cut out for it. (75)
- The impact in my case was a certainty that I did not want a job related to teaching science or anything else to elementary school age children. (91)

An impressive 73% of the respondents indicated that they are actively involved in one or more volunteer organizations within their communities (7% did not respond and 20% admitted that they were not currently involved in community service). Volunteering is organized according to education/children-related and science-related organizations. Of those who volunteer, 29% are involved in educational efforts, 19% are involved in scientific venues, and 25% are involved in other forms of volunteerism. Many (46%) are involved in a combination of educational, science-related, and other volunteer efforts. Public school members are over 40% more likely to volunteer than private school members, while females and Caucasians are over 10% more likely to volunteer than males and non-Caucasians. One-year and three-year members were 10-20% more likely to volunteer than two-year members. Skills learned in SSWK are now used by current adult volunteers:

The club had a very positive impact on my high school experience. It is one of the things I look favorably on, unlike the vast array of awkward high school moments

that I'd like to forget. In any case, all of these experiences shape who you are as a person. In fact, I recently used some of the things I learned in the club when I was demonstrating several science concepts to a group of Cub Scouts about 4th grade age. i.e., keep it simple, keep it fun, keep it moving, let them do it, etc. (80)

Lists of all their organizations and volunteer efforts depict countless hours of service for their communities and nation. These are truly the responsible, productive citizens that our schools are charged to produce. I am honored to have known all of these dedicated individuals.

### **In Summary**

High school students join ECA for a variety of reasons and not necessarily, interest in the subject (science). Exploratory-level science students are looking for fun, seeking a place to belong, and perhaps some interest in science. They value one-on-one interactions with the teacher. Teachers influence students to join science ECA by personal invitations, enlisting reticent, reluctant students; those who are shy, have low self-esteem, hate science or love literature. Students learn by social processes and groups of mixed social 'cliques' and interests promote active learning: "Everyone helped each other with everything." (18) These findings have significance in ECA and classroom grouping strategies in that mixed groups with a range of interests allow students to benefit from the enthusiasm of others for their areas of expertise or subject matter. Offering more exploratory-type ECA helps students discover their interests: "I was trying to find out what interests me." (42)

Being a member of SSWK was significant to these respondents as adolescents because they perceived making new friends, trying new identities, discovering things about themselves, and finding club activities very rewarding. The reality of participating in SSWK changed their perceptions about science and also produced perceived gains in science content knowledge. This finding alone should be exciting to every science teacher where 81% of participants in informal learning situations report increases in science content knowledge and continued enrollment in science courses: "It taught me that not all science is for brilliant minds and boring people." (5)

Respondents framed a reality around their experiences in SSWK to give meaning and direction to their lives both then and now. Their interpretations of these experiences helped shape who they have become: "I learned that I liked interacting with kids--now I'm a pediatrician!" (90) Respondents cited their increased awareness of science and education, enhanced career aspirations, and volunteerism: "In addition to the science component, it [SSWK] expanded my desire/acknowledgement of volunteerism." (76) SSWK is the "Brigadoon" of science education and everyone loved the place, er, ECA.

### **References**

Bakhtin, M. (1965). *Rabelais and His World*. Translated by Hélène Iswolsky. Bloomington: Indiana University Press, 1993. In Zappen, J.

(2005) Bibliographies. Downloaded September 12, 2008 from <http://www.rpi.edu/~zappenj/Bibliographies/bakhtin.htm>

Berg, B. (2004). *Qualitative research methods for the social sciences* (5th ed). Upper Saddle River, NJ: Pearson Education, Inc.

Blumer, H. (1969). *Symbolic interactionism: Perspective and method*. Englewood Cliffs, NJ: Prentice-Hall. In Berg, B. (2004). *Qualitative research methods for the social sciences* (5th ed), 9. Upper Saddle River, NJ: Pearson Education, Inc.

Broh, B. (2002, January). Linking extracurricular programming to academic achievement: Who benefits and why? *Sociology of Education*, 75(1), 69-95.

Chenail, R. (1995). *Presenting qualitative data*. The Qualitative Report, 2(3), 1-8. Retrieved January 7, 2007 from [www.nova.edu/ssss/QR/QR2-3/presenting.html](http://www.nova.edu/ssss/QR/QR2-3/presenting.html)

Crosnoe, R., Johnson, M. & Elder, G. (2004). School size and the interpersonal side of education. *Social Science Quarterly*, 85(5), 1259-1274.

Cushman, K. (2006, Feb.). Help us care enough to learn. *Educational Leadership*, 63(5), 34-37.

Darling, N., Caldwell, L. & Smith, R. (2005, 1st Quarter). Participation in school-based ECA and adolescent adjustment. *Journal of Leisure Research*, 37(1), 51-76.

Guest, A. & Schneider, B. (2003, April). Adolescents' extracurricular participation in context. *Sociology of Education*, 76(2), 89-109.

Janoski, T., Musick, M. & Wilson, J. (1998, September). Being volunteered? The impact of social participation and pro-social attitudes. *Sociological Forum*, 13(3), 495-519.

Lawton, C. & Bordens, K. (1995, March). Gender differences in science interests. Presentation at SRCDD '95: *Society for Research in Child Development*. Indianapolis, IN.

Lerner, A. & Lowe, F. (1954). *Brigadoon* [Motion Picture]. United States: MGM Pictures.

McNeal, R. (1999, June). Participation in high school EC: Investigating school effects. *Social Science Quarterly*, 80(2), 291-309.

Munro, M. & Elsom, D. (2000, January). Choosing science at 16. Monograph for *National Institute for Career Education and Counseling* (NICEC Briefing ED448334), 1-8.

Murphy, P. & Whitelegg, E. (2006, September). Girls and physics: Continuing barriers to 'belonging'. *Curriculum Journal*, 17(3), 281-305.

Pinciotti, P. (1993, July/August). Creative drama and young children: The dramatic learning connection. *Arts Education Policy Review*, 94(6), 24-29.

Powell, K. (2004). Developmental psychology of adolescent girls: Conflicts and identity issues. *Education*, 125(1), 77-87.

Reis, S., Colbert, R. & Hebert, T. (2005, Winter). Understanding resilience in diverse, talented students in an urban high school. *Roeper Review*, 27(2), 110-120.

Shank, G. (2006). *Qualitative research: a personal skills approach* (2nd ed). Upper Saddle River, NJ: Pearson Education, Inc.

Silliker, A. & Quirk, J. (1997, March). The effect of extracurricular activity participation on the academic performance of male and female high school students. *School Counselor*, 44(4), 288-294.

Simpkins, S., Ripke, M., Huston, A. & Eccles, J. (2005, Spring). Predicting participation and outcomes in out-of-school activities. *New Directions for Youth Development*, 2005(105), 51-69.

Thomas W. & Swaine, D. (1928). *The child in America*. New York: Knopf. In Berg, B. (2004). *Qualitative research methods for the social sciences* (5th ed), 9. Upper Saddle River, NJ: Pearson Education, Inc.

Voegel, P., Quashnock, K. & Heil, K. (2004, May). The student-to-student chemistry initiative: *Journal of Chemical Education*, 81(5), 681-684.

Wanlass, Y. (2000, May). Broadening the concept of learning and school competence. *Elementary School Journal*, 100(5, sp. ed.), 513-527.