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Abstract

Focus groups can be utilized effectively across various stages of instrument development. This article details selected aspects of a process in which they were employed at the initial stages of item generation and refinement in a study of occupational stereotyping. The process yielded rich contextual information about the worldview and corresponding terminology of participants. In addition, the use of a tool developed and previously employed as an approach to clinical case notes (i.e., SOAP notes), produced surprising benefits in documenting the focus group data. The purpose of this paper is to describe this process and highlight the insights that emerged. The process and outcomes have methodological implications for qualitative researchers conducting focus groups as well as for those developing new surveys, scales, and measurements.

Keywords

Focus Groups, STEM, Occupational Stereotyping, Item Development, SOAP Notes

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Using Focus Groups in Preliminary Instrument Development: Expected and Unexpected Lessons Learned

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Focus groups can be utilized effectively across various stages of instrument development. This article details selected aspects of a process in which they were employed at the initial stages of item generation and refinement in a study of occupational stereotyping. The process yielded rich contextual information about the worldview and corresponding terminology of participants. In addition, the use of a tool developed and previously employed as an approach to clinical case notes (i.e., SOAP notes), produced surprising benefits in documenting the focus group data. The purpose of this paper is to describe this process and highlight the insights that emerged. The process and outcomes have methodological implications for qualitative researchers conducting focus groups as well as for those developing new surveys, scales, and measurements. Key Words: Focus Groups, STEM, Occupational Stereotyping, Item Development, and SOAP Notes

In the context of conducting survey research, item generation is a critical step in instrument development. Often, the psychometric literature focuses on reliability and validity of items, rather than how the items emerged or evolved (Rowan & Wulff, 2007). Likewise, qualitative interviewing may be conducted in preparation for subsequent quantitative studies (Rowan & Wulff), yet serve as background rather than as the focus of discussion in scholarly publications. Sometimes interviews are integral to the overall research methodology, as in a mixed-methods design, and represent rich one-on-one data collection opportunities.

Initial qualitative inquiries may serve to ground successive research in real-life situations and observations, thus enhancing the later processes and final outcomes (Padgett, 1998; Ulin, Robinson, & Tolley, 2005b). Documenting these early steps allows researchers to trace initial origins of items or language, as well as later iterations of emergent or evolving concepts. In addition, recording the early views makes it possible to evaluate those views within the often larger and subsequent research study as it unfolds. Early perspectives in qualitative research thus can simultaneously encourage self-reflective research practices.

Among the rich benefits of conducting initial qualitative inquiries, is the potential to focus subsequent study on interview data, coupled with social interaction, to generate new ideas from the data themselves (Darkenwald, 1980). Thus, the initial inquiry is both exploratory and holistic (Saldana, 2009). In the case of our work, our end goal was to develop instruments examining college students' images and attitudes on scientists and science careers. As suggested by others, the best way to learn about student experiences is to ask the students' themselves (e.g., Singh, 2008), so we consulted actual college

students as credible experts (Creswell, 2003) in developing our items. In this way, too, we endorsed the perspective that the reality of participants is socially constructed, and largely based upon past and present interactions within their respective school, family, and community environments (Racher & Robinson, 2002). We intended that our work reflect this participant worldview and use accurate language.

In this paper, we will detail some of the key features of our focus groups and some of the new insights we gleaned about employing focus groups in item generation. Specifically, we will focus on frameworks and research questions; agenda setting and determining participation; data recording and field notes; and coding and other methodological issues. We will pay particular attention to a field note format previously used in clinical settings that we employed in our research process and that we believe has promise for future research initiatives.

While there is a rich and recent literature that provides guidelines for conducting research utilizing focus groups, the notion that focus groups play a critical "pre-design" role has yet to emerge. This gap provided us with an opportunity to develop our own vision for the process, tasks, and outcomes from focus group activities. Our primary goal was to develop an updated quantitative instrument to capture students' stereotypes of scientists. Initially, the focus groups were designed to explore the content of the known stereotypes, to confirm or challenge items that had been used for decades to measure stereotypes of scientists. Because our research focus was on instrument development and psychometric evaluation of a set of quantitative scales, it would have been time prohibitive, unrealistic, and not particularly useful for us to employ, for example, extensive transcription, multiple coding, and analytical processes that often accompany qualitative research utilizing focus groups. Yet, because an updated scale required exploring the sometimes contested territories of stereotypes, it quickly became clear that the details of the focus group discussions, what was said and unsaid, were of potential value to the overall project.

In this paper, we present an overview of a focus group process we utilized to stimulate discussion of images and attitudes that college students have toward both scientists and science careers. Embedded in the focus groups were questions and probes. For instance, "What do you think would be happening [if you were a scientist] in your family interactions?" was followed by probes to explore alienation/stress, support/encouragement issues. This process was designed to elicit any content related to gender and ethnicity that might inform students' images or stereotypes (i.e., scientists are white men) in relation to their career choices.

Background for Our Inquiry

Knowledge about self and careers may be based on concrete and factual knowledge, as well as upon individuals' stereotypes about careers (Ancis & Phillips, 1996; Mav, 2003; Ross-Gordon, 1999). These stereotypes may then serve to promote or inhibit the creation of a conceptual match between the individual and a particular career (Kleinman, 1998). Stereotypes may serve to support or deter one from pursuing a specific career path (Crawford, 2006). From a personal perspective, they may become incorporated into one's self concept and as such, facilitate self-fulfilling prophecies and other types of internalized oppression. Moreover, they may reinforce differences in

perceived status and power among self and others such as discrimination or other sexist behaviors (Crawford). Images of scientists differing by ethnic and gender background span students from elementary school (Sumrall, 1995) to college (Fouad, 2002). Cross-cultural research also suggests differences among ethnic and gender groups in terms of their expressed interests in both career-related tasks as well as specific careers in general (Byars & Hackett, 1998; Fouad; Fouad & Mohler, 2004). Since women and people of color are disproportionately represented at both college and professional levels, particularly in fields such as sciences and engineering (National Science Foundation (NSF), 2004), it is possible that stereotypes are at play in career development in science, technology, engineering, and mathematics (STEM) fields.

This work is important because the national demand for scientists and engineers exceeds the current numbers of students choosing majors and future careers in those areas (NSF, 2004). Conventional wisdom suggests that students opt out of these careers because they view them as too demanding, too competitive, and too exclusionary of healthy family lives. Available assessment tools in this arena have not been updated for 30 years or more; thus, there is a great need for updated approaches to contemporary assessment (Wyer, Schneider, Nassar-McMillan, & Oliver-Hoyo, 2010).

Our project was initially conceptualized to develop an assessment tool to examine college students' images and attitudes toward science and scientists, in order to update outmoded instruments with contemporary career items and more culturally (i.e., gender and ethnicity) sensitive items. The research team is comprised of academicians from the fields of psychology, counseling, and science education with backgrounds in gender studies, career development and ethnicity, and science education. We each approached the project from different fields yet shared the concern over contemporary information about students' images of science, particularly with regard to gender and ethnicity. All three of the faculty research team members are women representing diverse ethnicities. We all came to the project with long-standing commitments and expertise in diversity in higher education. In addition, we had several graduate research assistants from diverse ethnicities and gender who contributed to our weekly group team meeting discussions. The broader research goals included development and validation of an assessment tool, utilization of the resulting instrument in a national study, and development of an intervention project to demonstrate an intervention based on data gleaned from the initial steps of the study.

Methods

We employed several simultaneous steps in our item generation stage, creating a pool of items based on a thorough literature review, existing scales, and our own expertise; rigorous review and revision by our experienced research team; and consulting with participants (Nassar-McMillan & Borders, 2002). The specific and detailed descriptions of each step of our focus groups process are beyond the scope of this paper, with our present aim being to provide a general overview of the steps we underwent. Among the key steps in our plan were: (a) deciding on appropriate frameworks to pose the types of research questions we had identified as most helpful to our outcome, (b) selecting participants and setting the agenda; (c) data recording and field notes; and (d) coding and other methodological issues. These steps will be further detailed below.

Determining Frameworks and Research Questions

The participant population of college students represented a credible expert group in helping to generate items for subsequent survey instruments (Creswell, 2003). Because we wanted to pose research questions that would probe students on images, meanings and interpretations associated with science careers and scientists, we opted to utilize an open-ended interview framework within our focus groups format. Thus, we did not incorporate any of the specific items concurrently being generated from the search of the literature and existing relevant scales. Rather, we were committed to utilizing a phenomenological perspective in order to most effectively reveal the images, meanings, and interpretations of participants (Miles & Huberman, 1994; Racher & Robinson, 2002). The questions we posed were designed to elicit general information about participants' images of science professions and professionals, with attention to how these views were expressed and how they formed or evolved. Thus, we intended to glean insights into language, perspective, and world view. Ten open-ended questions were developed for this purpose, including several that related specifically to participants' social and cultural context, along with specific probes to help facilitate more discussion or to explore certain topics in more depth. These questions and accompanying probes are listed below (relative to the context of, "If you were a scientist"):

(1) What do you see yourself doing each day?
(Probe topics: working nights, doing experiments, writing grants)
(2) What is the physical environment in which you would be working?
(Probe topics: indoors/outdoors, lab/office, observatory, greenhouse)
(3) What kinds of materials or tools would you be using?
(Probe topics: computers, test tubes, microscopes, telescopes)
(4) What do you think would be happening in your interactions with colleagues?
(Probe topics: social activity, professional arguments, help and advice)
(5) What do you think would be happening in your interactions with family?
(Probe topics: alienation/stress, support/encouragement, irrelevant)
(6) What would be the satisfactions of your work?
(Probe topics: benefits to humankind, income, status)
(7) What would be the discouraging components of your work?
(Probe topics: misuse and abuse of findings, time demands, unequal rewards)
(8) How would you "fit in" as a scientist now?
(Probe topics: access, aspirations, achievement, attitudes)
(9) What are the qualities that make a person a good scientist?
(Probe topics: intelligence, personality, training/education)
(10) What does it mean to be a "scientist"?
(Probe topics: commitment/dedication, vision/imagination, objectivity/rationality)

Selecting Participants and Setting the Agenda

Prior to recruiting participants, we obtained Institutional Review Board approval from our university to conduct focus groups on the campus with university student volunteer participants. We utilized an intensity sampling approach by visiting the classes of cooperating faculty and inviting students to participate in one of five focus group meetings (Ulin, Robinson, & Tolley, 2005a). All of these classes were designed to meet the general education requirements at our university, and most were science courses. The composition of the first four groups was relatively homogenous, in that students were sampled from a specific science program that had higher numbers of women in the program compared to other science programs at the university. This led to a sample of participants perhaps more likely to have a heightened awareness of gender and ethnicity issues in STEM programs. We utilized the fifth group to add some heterogeneity to our sample by collecting data about non-science major students' experiences with, and perceptions of, science and scientists.

Students were given an informed consent form that explained the voluntary nature of the research and their right to withdraw at any time without penalty. No identifying information was collected.

In all of the focus groups, we initiated the agenda by inviting participants to draw a picture of a scientist, as in the Chambers' DrawAScientist Test (1983). At a later point in the one hour session, students were given the opportunity to talk about their drawing (i.e., probed about personal characteristics, tools, demographic background of person drawn) within a larger context of their gender and ethnic background. The stems were asked and discussed, with probes utilized as needed. An important part of this stage of data collection was to use the pre-developed research questions while allowing the flexibility to ask new questions when the responses appeared incomplete or otherwise problematic (Greenbaum, 1993; Huberman & Miles, 1983). In our groups, the structure was modified somewhat depending on size and other group factors. This flexibility and creativity in carrying out the agenda was important in managing the group dynamics and flow, thus enhancing the quality of the emergent data (Saldana, 2009). In addition, it allowed for certain issues to be probed more deeply, as needed and appropriate (Greenbaum). Moreover, it empowered the group facilitator to implement measures to ensure that all participants felt heard, validated, and respected – this was particularly important to our research team, given the sensitive nature of diversity topics (Vaughn, Schumm, & Sinagub, 1996).

Data Recording and Field Notes

In selecting appropriate data recording formats and processes, we considered strategies that would best help organize our data (Saldana, 2009). Because we wanted to capture narrative and verbal exchanges in an exploratory and holistic way, it was necessary to document otherwise ephemeral highlights of a focus group's discussion. We also wanted documentation points both during and after each group, given that, although we audio recorded the sessions for later review as necessary, we elected not to transcribe them.

Our data collection process was one not previously noted in the professional literature for such a purpose, but was selected as an appropriate and innovative technique for data reduction, given that we did not intend to conduct an extensive coding or other rigorous qualitative analysis procedure with our data, but rather, wanted to "get into" the mindset and vernacular of college students engaged in career exploration. We utilized SOAP notes, originally developed by Weed (1968) for use by medical professionals, but since then adapted for and well utilized in other allied health professions (Beinecke, 1984), including counseling (Turtle-Song, 2002). Subjective, Objective, Assessment, and Plan (SOAP) data were collected at three different points in time for each focus group—before, during, and after.

TIME	SUBJECTIVE (participant reports/perceptions)	OBJECTIVE (participant behaviors—measurable)	ASSESSMENT (facilitator thoughts & feelings)	PLAN (ideas for revision/subsequent groups)
Before	e.g., any prepping or info provided by contact person; others –"professor reports this group mostly male/academically motivated/extra credit will be given", etc.	N/A	e.g., any preconceived ideas/notions about this group—"I anticipate that engineering students will approach questions less emotionally; I feel more nervous about this group", etc.	N/A
During	e.g., "students state they don't like drawing scientist activity; have a hard time with questions about family" etc.	e.g., "participants appeared rushed; talked quickly; interrupted one another at 3-5 points", etc.)	e.g.," what is going on—check out this frustration/depth/opinion in this group or next"	Same as During: assessment (left)
After	More as During: subjective (above)	More as During: Objective (above)	More as During: Assessment (above)	More as During: Plan (above)

Coding and Analysis

Because the purpose of our focus groups process was to generate items as well as to help refine the items simultaneously being generated and developed through our literature review and panel and expert reviewers, it was important to continue this phase of focus group inquiry until we stopped making new discoveries, or, until we thought that the knowledge contribution generated was saturated, or when the focus group discussions were no longer generating new insights (Saldana, 2009). The focus groups were primarily conducted by one graduate research assistant (GRA) member of our research team. She was selected for this role based on her experience in facilitating groups in a community agency, and her skills in group facilitation, in general. After each focus group, that researcher met with one of the project's faculty members to process the experience. That faculty member served as an auditor of sorts in terms of recognizing inherent researcher bias and ensuring that any potential bias not be imposed on the participants or group process. In preparation, that supervising Principle Investigator (PI) reviewed the SOAP notes and was ready to hear a narrative account from the GRA, as well as to pose questions and look for potential ways that any GRA's biases or preconceived notions may have had an impact on the focus group participation or discussion. Thus, although the notes documented highlights of the group discussions, other themes or data could potentially emerge from our post-group "processing" discussions. After these one-on-one discussions, any important themes that warranted further examination or posed implications for editing language of the items simultaneously being developed were brought to the larger research team to further discuss. For example, the discussion around whether partipants might have family members in science fields helped us to develop the wording for a question on the instrument about whether anyone in the respondents' family has a career in science.

In some ways, the SOAP notes format allowed for reflective journaling by the GRA – focus group facilitator, helped create transparency in the research process, and engaged the GRA and even the full research team, at times, in self-reflection relative to the research design (for example, the ways in which the discussion seemed to flow in a few of the groups helped us to refine the structure of the instrument being developed into various sections with their own respective internal sub-structure). These are all important hallmarks of effective qualitative methods (Ortlipp, 2008). Finally, this on-going review of the focus groups helped us to identify when the data we were collecting had reached the saturation point (Saldana, 2009).

Results

In general, the results of this portion of our research suggested that participants held varying views about gender and ethnicity in relation to STEM programs. Some of the participants felt very strongly about these issues while others felt that what we were talking about was not important at all. Some participants exercised their option to decline participation, even as early as the initial drawing exercise, while other participants stayed after the focus group session ended in order to continue talking with their peers or with the facilitator about the emergent issues.

A second observation was that participants relied heavily on generalizations and individual experiences to justify their perceptions. It was quickly discovered that participants used the perceived experiences of friends to explain the role that gender and ethnicity play in STEM programs. For instance, it was not uncommon for students, particularly males or those of European descent, to state that they had "a friend" who did represent a minority group (e.g., female, African American or Hispanic) and that that person was doing fine in the respective STEM program.

When the participants were asked, later into the focus group sessions, to revisit the scientist pictures they had initially drawn and asked to examine the degree to which it reflected their own characteristics, many participants were surprised to say that they had not drawn themselves. Even participants who clearly stated an intention to pursue a STEM career did not consistently draw a scientist that was doing the work that they planned on doing. For instance, in the first two focus groups there was one female in each group and neither of them drew a female scientist. Both of the women were taken aback after realizing that they had drawn a picture of a male scientist. In the larger focus group composed of biomedical engineering students, the participants were also surprised at the differences between what the class members drew in terms of race and gender of a scientist and their own respective demographics. In this group, when the facilitator asked about participants' own ethnicities, one participant stated that he was embarrassed to admit that, although he was Native American, it had not occurred to him to draw a Native American scientist. This observation aided in our understanding of the importance of addressing people's expectations of gender and ethnicity roles in science professions.

In the final focus group, composed of introductory psychology students, one African American participant revealed an interesting concept. He presented a belief that having to work harder to succeed was a positive thing because it encouraged him to have passion for what he did. Even after some probing by peers he did not appear to view that phenomenon as being unfair, supporting a notion sometimes referred to as "Black tax,", which explains the perception of having to work harder if one is African American (Peckham, 2005). This discussion clarified the need to discuss people's perceptions of gender and ethnicity opportunities in STEM programs and how they think those opportunities should play out.

Discussion and Implications for Future Research

The focus groups, in our experience, served as an invaluable tool for gathering data to inform the next step in our research project. We utilized these data in our concurrent item generation and subsequent item refinement stages, ultimately creating a list of survey items designed to broaden our understanding of STEM fields in the contexts of gender and ethnicity. For example, the ongoing weekly research team discussions provided the avenue for us to apply any obvious language or conceptual changes needed to the items being developed, as well as helping to tease out the subtle nuances of meaning and worldview that might have been unattainable through a quantitative methodology. These subsequent items directly addressed students' values about, and perceptions of, inequality in STEM careers. An unintentional result of the focus groups was realizing that the format created ample opportunities for discussion about topics that not only gave information to the researchers but to the participants as well. It was clear

that this experience gave many participants the words to express their current understandings of the issues we addressed. Because women and people of color are underrepresented in STEM fields (NSF, 2004), exploring this issue with STEM students is critically important in order to further researchers' *and* practitioners' understandings of this phenomenon, within both career and broader student development contexts.

On the one hand, we realize that the results of our focus groups discussions, while useful for our own research purposes, can in no way be generalized to the same or other populations. On the other hand, some of our discoveries about the methodological logistics of collecting culturally sensitive data--as well as insights about STEM college students' attitudes and images of science and scientists--warrant further exploration for adaptation to other parallel contexts in both research and practice. Again, we will focus on the key emergent issues introduced in our earlier description of Research Steps: (a) frameworks and research questions; (b) participant selection and agenda setting; (c) data recording and field notes; and (d) coding and other methodology.

Insights into Frameworks and Research Questions

The intended outcome of our focus groups process was to develop a heightened awareness of college students' phenomenological experiences and perspectives on STEM professions and professionals (Racher & Robinson, 2002). To that end, our open ended frameworks, with optional accompanying probes, appeared to be an effective approach in terms of collecting data that could be utilized in our later research stages. This approach of gathering qualitative data to inform the subsequent development of quantitative survey instruments was especially useful in that it helped to refine the content concurrently generated through items from relevant instruments and inform hypotheses for later research steps (Ulin et al., 1995a, 1995b), as well as to enhance the content validity of our instrument-in-development.

Insights into Participant Selection and Agenda Setting

The differing levels of diversity in the focus groups had an impact on the range of opinions on discussion topics. This result became most clear during the final focus group. This focus group was composed of all males of differing ethnicities, with only a small portion representing STEM programs. This group had very little to say about gender issues in STEM programs but clearly expressed strong opinions about issues related to ethnicity. Upon further reflection, it became apparent that the past focus groups, more evenly represented by females and males in contrast to this all-male group, had engaged in more substantive comments and discussion about perceived gender issues. Past research has suggested that group diversity may promote both more expeditious and more comprehensive problem solving for simple tasks and that conversely, for more complex tasks, heterogeneity may hinder the process (McLeod, Lobel, & Cox, 1996; Milliken & Martins, 1996). This rationale could explain why a group with no gender variability had relatively little to say about gender issues. These results may also help to explain why the fourth focus group, more heterogeneous in composition, engaged in considerable discussion and disagreements. For counseling

researchers and practitioners, group participant selection will need to be connected with the intended goals of the group as well as the group format and agenda.

As in our case, developing a group agenda ahead of time is vital to the success of the group process. At the same time, allowing for flexibility can greatly enhance the overall outcomes (Miles & Huberman, 1994). Our basic structure involved drawing a scientist (Chambers, 1983) and then asking questions about self and others with optional "probes", pre established to help provoke and clarify rather than direct discussion. This structure was utilized to varying degrees across the series of focus groups. The agenda was originally planned for approximately eight to 12 participants, yet we were offered the opportunity to meet with at least one large group, in which the planned agenda would have been unwieldy if not impossible to conduct. Thus, being conscious of time and other constraints made it necessary *not* to rigidly adhere to the pre-set agenda (Greenbaum, 1993). This flexibility allowed the facilitator to probe more deeply into certain issues, skip items that might already have been inadvertently discussed, or allow new items to emerge from discussion of the pre-generated ones. In all cases, the facilitator took care to avoid probing into topics too deeply, particularly if they appeared to be sensitive for one of the participants (Vaughn et al., 1996). The level of flexibility in focus groups utilized in research may be dependent upon the final purposes for which the data will be used. In practice, however, counselors should be attuned to the needs of the group in terms of where they may choose to take the discussion, use effective group facilitation skills to ensure "air time" for all participants, and look for individuals who may need individual follow up intervention.

Insights into Data Recording and Field Notes

Our use of the SOAP (Turtle-Song, 2002) format to structure the field notes served several useful purposes. The structural elements (e.g., subjective, objective, assessment, and plan) allowed for both qualitative and quantitative data collection. For example, objective information included numerical counts of various demographic characteristics of participants in each group. At the same time, subjective information included data such as participants' nonverbal behaviors or the facilitator's reactions to specific situations within the group format. This process of reflexivity is particularly important in a research-oriented group facilitation process to aid the facilitator and the research team in identifying any potential subjective biases that may impact the outcomes (Mays & Pope, 2000). Likewise, it is important for career counselors and other student development professionals to be aware of their own biases so as to avoid imposing them upon their clients. Recording SOAP data before, during, and after added an element of validity to the data documentation process by triangulating, or collecting and examining data from various points in each focus group process (Creswell, 2003). It also served to support the flexibility or iterative nature of the overall focus groups process (Miles & Huberman, 1994). It became clear, for instance, that discussion among students would "freeze" if students' stereotypes about women or ethnic differences were addressed directly – presumably for fear of censure. Discussion of the DAST drawings, however, allowed this content to surface as self-reflection rather than (potentially negative) comments about others.

Insights into Coding and Analysis

The coding processes we engaged were generally two-fold. Data from the first several groups (e.g., the first two) were viewed from a rather descriptive, or "grand tour" approach (Saldana, 2009, p. 47). Although we posed specific questions, or probes, in our structural agenda for each group, we initially wanted to glean a holistic view of the participants' worldview, perceptions, and language, along with their interactions amongst one another. In the later groups we were more analytical, or elaborative (Saldana), in our analyses and interpretations, and, because we had already clarified the more general and simplistic ideas and concepts with the earlier groups, were able to attend more deeply to their perceptions as well as to more personal and sensitive topics. For example, while the earlier focus group discussions might have yielded actual new topics or items, later groups helped us to refine the specific concepts and identify accurate language.

The post group discussions between the GRA and the supervising PI along with the full research team served to triangulate the data, since the team was concurrently reviewing the literature and items and language from existing instruments (Singh, 2008). This process of post-group processing created an overarching iterative and systemic development of items, and also allowed our own values, as a team, to emerge into the final outcome, or at least, the next stage of the research project (Miles & Huberman, 1994).

Conclusions

Our focus groups process was effective in stimulating discussion about images and attitudes that college students hold toward both scientists and science careers. Embedded in the focus groups were questions designed to examine gender and ethnic influences as potential precursors to the current-day images or stereotypes that college students hold. The group format also incorporated the DrawAScientist Test, for the purpose of eliciting participants' visual images of scientists and subsequent discussion around the images yielded within the group. This pre-focus group format was utilized concurrently with the instrument development step of compiling instruments and items for consideration for inclusion on our assessment tool, and ultimately served to inform the subsequent selection of relevant items for the next step in our research.

The next stage, in which we culled extraneous items from selected instruments, was considerably enhanced by the insights gained from the focus groups. In addition, a number of new items that emerged out of the group discussions were added to the next draft of the instrument. Utilizing an open-ended, qualitative format ensured that the group discussion guided the development of the instrument, rather than vice versa.

The benefits of utilizing focus groups as an early stage in instrument development were clear in the present study. In addition, the richness of the group discussions was noted as being advantageous for many of the student participants. Moreover, we came to realize that similar group processes may be effectively utilized as a counseling intervention for STEM or non-STEM majors alike. We further believe that focused questions, such as those utilized in our study, can be utilized in individual career interventions, as well, in order to help clients to examine the ways in which both their self knowledge and their knowledge about careers and career options may be influenced by

gender and ethnic stereotypes about themselves and others. As a team of research-practitioners, it was doubly rewarding to discover the potential applications of our current focus groups research process to further research and practice.

References

Ancis, J. R., & Phillips, S. D. (1996). Academic gender bias and women's behavioral agency self-efficacy. *Journal of Counseling and Development, 75*, 131-137.

Beinecke, R. H. (1984). PORK, SOAP, STRAP, and SAP. *Social Casework: The Journal of Contemporary Social Work*, 65(9), 554-558.

Byars, A. M., & Hackett, G. (1998). Applications of social cognitive theory to the career development of women of color. *Applied and Preventive Psychology*, 7, 255-267.

Chambers, D. W. (1983). Stereotypic images of the scientists: The draw-a-scientisttest. *Science Education, 67*, 255-265.

Crawford, M. (2006). *Transformations: Women, gender and psychology*. New York, NY: McGraw-Hill.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed method approaches* (2nd ed.). Thousand Oaks, CA: Sage.

Darkenwald, G. (1980). Educational and career guidance for adults: Delivery system alternatives. *Vocational Guidance Quarterly, 28*(3), 200-206.

Fouad, N. A. (2002). Cross-cultural differences in vocational interests: Between-group differences on the strong interest inventory. *Journal of Counseling Psychology, 49*, 282-289.

Fouad, N. A., & Mohler, C. J. (2004). Cultural validity of Holland's theory and the strong interest inventory for five racial/ethnic groups. *Journal of Career Assessment, 12*, 423-439.

Greenbaum, T. L. (1993). *The handbook for focus group research*. New York, NY: Macmillan.

Huberman, A. M., & Miles, M. B. (1983). Drawing valid meaning from qualitative data: Some techniques of data reduction and display. *Quality and Quantity, 17*, 281-339.

Kleinman, S. S. (1998). Overview of feminist perspecties on the ideology of science. *Journal of Research in Science Teaching, 35*(8), 837-844.

Mav, W. C. (2003). Factors that influence persistence in science and engineering career aspirations. *The Career Development Quarterly, 51*, 234-243.

Mays, N., & Pope, C. (2000). Assessing quality in qualitative research. *British Medical Journal, 320*(7226), 50-52.

McLeod, P. L., Lobel, S. A., & Cox, T. H., Jr. (1996). Ethnic diversity and creativity in small groups. *Small Group Research, 27*, 248-264.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage.

Milliken, F. J., & Martins, L. L. (1996). Searching for common threads: Understanding the multiple effects of diversity in organizational groups. *Academy of Management Review, 21*(2), 402-433.

Nassar-McMillan, S. C., & Borders, L. D. (2002). Use of focus groups in survey item development. *The Qualitative Report, 7*(1). Retrieved May 16, 2007, from http://www.nova.edu/ssss/QR/QR7-1/nassar.html

National Science Foundation. (2004). *Division of Science Resources Statistics, special tabulations of U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey, 1966–2001.* Retrieved November 5, 2006, from http://www.nsf.gov/statistics/wmpd/degrees.cfm

Ortlipp, M. (2008). Keeping and using reflective journals in the qualitative research process. *The Qualitative Report, 13*(4), 695-705. Retrieved May 16, 2007, from http://www.nova.edu/ssss/QR/QR13-4/ortlipp.pdf

Padgett, D. K. (1998). *Qualitative methods in social work research: Challenges and rewards*. Thousand Oaks, CA: Sage.

Peckham, A. (2005). *Urban dictionary*. Kansas City, KS: Andrews McMeel Publishing.

Racher, F. E., & Robinson, S. (2002). Are phenomenology and postpositivism strange bedfellows? *Western Journal of Nursing Research, 25*, 464-481.

Ross-Gordon, J. M. (1999). Gender development and gendered adult development. *New Directions for Adult and Continuing Education, 84*, 29-37.

Rowan, N., & Wulff, D. (2007). Using qualitative methods to inform scale development. *The Qualitative Report, 12*(3), 450-466. Retrieved May 16, 2007, from http://www.nova.edu/ssss/QR/QR12-3/rowan.pdf

Saldana, J. (2009). *The coding manual for qualitative researchers*. Thousand Oaks, CA: Sage.

Singh, P. (2008). The unexpected rewards of qualitative research in assessment: A case example. *The Qualitative Report, 13*(2), 278–300. Retrieved May 16, 2007, from http://www.nova.edu/ssss/QR/QR13-2/singh.pdf

Sumrall, W. (1995). Reasons for the perceived images of scientists by race and gender of students in grades 1-7. *School Science and Mathematics, 95*, 83-90.

Turtle-Song, I. (2002). Learning to write case notes using the SOAP format: Subjective, objective, assessment, and plan. *Journal of Counseling and Development, 80*, 286-292.

Ulin, P. R., Robinson, E. T., & Tolley, E. E. (2005a). Designing the study. In P. R. Ulin, E. T. Robinson, & E. E. Tolley (Eds.), *Qualitative methods in public health: A field guide for applied research* (pp. 33-69). San Francisco, CA: Jossey-Bass.

Ulin, P. R., Robinson, E. T., & Tolley, E. E. (2005b). Qualitative data analysis. In In P. R. Ulin, E. T. Robinson, & E. E. Tolley (Eds.), *Qualitative methods in public health: A field guide for applied research* (pp. 139-174). San Francisco, CA: Jossey-Bass.

Vaughn, S., Schumm, J. S., & Sinagub, J. M. (1996). *Focus group interviews in education and psychology.* Thousand Oaks, CA: Sage.

Weed, L**.** (1968). Medical records that guide and teach. *New England Journal of Medicine, 278*, 593-597.

Wyer, M. W., Schneider, J. S., Nassar-McMillan, S., & Oliver-Hoyo, M. (2010). *Revisiting students' stereotypes about science and scientists in the United States*. Unpublished manuscript, North Carolina State University at Raleigh.

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