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The Impact of Self-Efficacy and Vicarious Learning on African American Girls’ Investigative Interests

Ercilla Glean, Luis Marquez & Caitlin Mercier

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Abstract

The current study examines the influence of a video-based vicarious learning experience on investigative interests (having high interest in mathematics, science, and research) among African American adolescent girls while accounting for preexisting levels of investigative self-efficacy, confidence in one’s ability to perform a specific task. Participants completed a self-efficacy pretest prior to being randomly assigned to one of two groups: one group watched the video and the control group did not. Separating participants based on the self-efficacy pretest into high self-efficacy and low self-efficacy groups, a repeated measures ANOVA showed that after watching the video, the high investigative self-efficacy group’s investigative interests increased, while the low investigative self-efficacy group’s interests decreased. Overall, these findings demonstrate how modeling and observational learning impacts career behavior differentially based on self-efficacy for African American girls.

Key Terms:

- Learning Experiences
- SCCT
- Interests
- Self-efficacy
- African American
While African American women are more likely than European American women to enroll in Science, Technology, Engineering, Math, and Medicine (STEM+M) majors, they are less likely to graduate with degrees in STEM+M fields (National Science Foundation, 2016). Furthermore, they are less represented at the elite levels of these occupations in comparison to European American women (National Science Foundation, 2016). In the current study, we sought to explain why this disparity exists by examining the impact of a vicarious learning experience on interests while accounting for preexisting levels of self-efficacy in a sample of African American girls who aspire to join the STEM+M fields.

Vocational Psychology Theory and related research may explain this disparity. Gottfredson (1981) noted that occupational development begins in childhood with two overarching processes: circumscription and compromise. The stages of circumscription are (1) orientation to size and power, (2) orientation to sex roles, (3) orientation to social values, and (4) orientation to internal, unique self. Orientation to size and power occurs between the ages of three and five, where children become aware that they will eventually take on adult roles. Orientation of sex roles occurs from the ages six to eight when children begin to assign behaviors based on sex-based observations. They observe that certain jobs do not match their sexes and deem those jobs as unacceptable. Orientation to social values occurs between the ages of nine and 13, where children begin to categorize jobs in terms of social status (e.g., income, education, lifestyle). They begin to view certain jobs as unacceptable because they do not meet their minimum status levels or they may exceed the maximum effort they are willing to exert. Orientation to internal, unique self begins at age 14. During this time, factors such as interests and self-efficacy weed out any lingering jobs that do not align with these characteristics. After the final exclusion of jobs that are outside an individual’s social and personal space, the final step of compromise occurs. Individuals will sacrifice careers that are more compatible with their self-concepts for jobs that are accessible to them. Exposure to certain occupations influences perceptions of accessibility, which affects career aspirations.

As such, children are influenced by the messages they hear and the models they see, which influence future career decisions, often through the development of self-efficacy beliefs. Bandura (1977) asserted that self-efficacy beliefs are acquired through four sources: personal performance accomplishments, vicarious learning, social/verbal persuasion, and physiological/emotional arousal. Performance accomplishments are based on personal mastery experiences. Successes raise mastery expectations, while failures lower them. Vicarious learning occurs when an observer sees another person accomplish activities without any adverse consequences, and this observation generates expectations in the observers that they, too, can accomplish activities if they persist in their efforts. Vicarious learning builds self-efficacy if the models show an outcome that is obtainable by the observer and if the characteristics of the models align with the person observing the activities. Social/verbal persuasion occurs when people are informed that they can accomplish an activity. This persuasion improves outcome expectations, which in turn builds self-efficacy. Physical/emotional arousal occurs when completing a stressful or taxing activity. High arousal debilitates performance, meaning that individuals are less likely to achieve success when they experience aversive arousal. When individuals perceive themselves as less vulnerable to stress, they are less likely to generate thoughts of fear or inadequacy about an accomplishing an activity. They, in turn, perform the activity successfully, strengthening self-efficacy (Bandura, 1977).
For African American girls and women, finding vicarious learning models in the STEM+M fields to build self-efficacy is a complicated task. Despite the growth of the STEM+M fields in the United States, people of color continue to be underrepresented (Webber & Canché, 2015). The scarcity of African American women in the professional STEM+M fields may account for the poor attrition of African American women in STEM+M majors in college (Garriott et al., 2014). If African American girls were exposed to models who were relevant to them (i.e., African American women in the STEM+M fields), then vicarious learning would better occur (Bandura, 1977) because individuals are less likely to be affected by vicarious learning when the model is irrelevant to them (Hackett & Byars, 1996). Young African American girls are not readily exposed to women in high positions who resemble them, which relays a message that they cannot achieve the same goals or have the same careers as men or European Americans. This observation likely lowers self-efficacy in STEM+M activities and majors (Hackett & Byars, 1996).

Social Cognitive Career Theory (SCCT; Lent, Brown, & Hackett, 1994) can further explain the relation between vicarious learning and self-efficacy. SCCT focuses on the processes through which (1) academic and career interests develop, (2) interests promote career development, and (3) people attain varying levels of performance and persistence in their educational and career pursuits (Lent et al., 1994). SCCT indicates that background environmental possibilities affect learning experiences, which influences self-efficacy, which in turn affects interest (Lent et al., 1994). SCCT and Holland’s Theory of Vocational Personality Themes (Holland, 1959, 1997) have been connected to better explain interest development (Ludwikowski, Armstrong, & Lannin, 2017; Sheu et al., 2010). Holland (1959, 1997) proposed that career behavior is a result of the interaction between individuals and their environments with six themes into which people and environments can be classified: realistic, investigative, artistic, social, enterprising and conventional (RIASEC). The investigative theme is most associated with the STEM+M fields. Individuals who are investigative tend to enjoy knowledge creation, science, and mathematics (Holland, 1959; 1997). Women tend to report lower levels of interest in Holland’s investigative theme compared to men (Betz & Gwilliam, 2002; Su, Rounds, & Armstrong, 2009). Garriott et al. (2014) examined the effect of four investigative learning experiences in the SCCT framework. Of the four learning experiences, performance accomplishments and vicarious learning experiences positively affected investigative career development. They found that vicarious learning directly affected investigative self-efficacy and indirectly affected investigative interests. Learning from relevant models in the STEM+M fields should provide students of color with the self-efficacy they may need to develop an interest in these fields. Without vicarious learning, STEM+M interest may not develop.

Overall, these findings indicate that modeling and observational learning may impact future career behavior. While SCCT has been used to explain ethnically/racially diverse individuals’ career behavior (Hackett & Byars, 1996; Garriot et al., 2014; O’Brien et al., 2014), few studies have experimentally examined how vicarious learning affects African American girls’ career development. Furthermore, career workshops have demonstrated utility in positively affecting the career decision-making process (Hanse, Aaron, Jackson, Pedersen, 2017). The current study utilized an in-person career workshop in order to assess how a realistic video-based vicarious learning experience highlighting medical jobs impacts adolescent African American girls’ investigative
interests, as a function of preexisting levels of investigative self-efficacy. We expected that African American girls with lower investigative self-efficacy would be affected differently compared to African American girls who entered the career workshop with higher investigative self-efficacy. Specifically, because learning experiences indirectly affect interests (Garriott et al., 2014), we hypothesized that the video-based vicarious learning experience, which highlighted various medical occupations, would improve investigative interest for both low and high investigative self-efficacy groups; however, we expected that the increases in investigative interests would be higher for the group entering the career workshop with lower levels of investigative self-efficacy.

Method

Participants

Forty-nine African American middle and high school girls participating in a summer enrichment program at a Historically Black College/University (HBCU) in the Southeastern United States served as participants in this study. Two participants were removed because they were able to guess basic tenets of the study. Of the remaining participants, their ages ranged from 12 to 18 ($M = 16.2, SD = 1.56$). Forty participants were high school seniors (85.1%), one participant was a high school junior (2.1%), two participants were high school freshmen (4.3%), two participants were high school sophomores (4.3%), one participant was an eighth grader (2.1%), and one participant was a sixth grader (2.1%).

Measures/Materials

Participants responded to the eight Set A investigative activity items from the Alternate Forms Public Domain (AFPD) RIASEC marker scales (Armstrong, Allison & Rounds, 2008). Participants rated how much they would like to perform each work activity, such as “installing flooring in houses,” using a 5-point Likert response format, ranging from 1 (Strongly Dislike) to 5 (Strongly Like). Following the procedure outlined in Armstrong and Vogel (2009), participants completed the 8 Set B investigative activity items, using an alternative self-efficacy rating format. Participants rated their confidence in their abilities to reform each work-related activity on a 5-point Likert response format, ranging from 1 (Very Low Confidence) to 5 (Very High Confidence). Correlations between the AFPD scales and the 1994-edition of the Strong Interest Inventory ranged from .56 to .72, demonstrating convergent validity (Armstrong et al., 2008). Multidimensional scaling analyses support RIASEC order predictions for the interests and self-efficacy scales (Armstrong & Vogel, 2009). Additionally, correlations between the interest and self-efficacy scales mimic commercial RIASEC interest and self-efficacy scales with a range between .60 and .72. Internal consistency estimates for both sets of activity-based scales range from .79 to .94 (Armstrong et al., 2009). In the current study, pretest and posttest interest items were found to have good internal consistency, $\alpha = .80$ and $\alpha = .84$, respectively. Pretest and posttest self-efficacy items both demonstrated Cronbach’s alphas of .86.

A video with several medical occupations was crafted in order for students to learn more about various medical careers, including depictions of a plastic surgeon, a general surgeon, a psychiatrist, a dermatologist, a physical therapist, an orthodontist, an oncologist, and an ophthalmologist. The plastic surgeon, a European American woman, performed carpal tunnel surgery on a boy while narrating the process. The general surgeon, a European American man, performed an appendectomy on a patient. The psychiatrist was a European American man, who conducted therapy with a client. The dermatologist, an Asian American woman, analyzed a biopsy of a patient, showing
how she extracted the piece of skin and what she was examining under the microscope. The physical therapist, a European American man, rehabilitated an athlete, narrating what he was doing with the injured body part. The orthodontist, a European American man, applied braces to a patient. The oncologist, an Asian American woman, discussed the analysis and procedure for treating cancer. The ophthalmologist, a European American man, performed cataract surgery.

The demographic survey included questions regarding age, gender, grade point average, and grade level. At the end of the demographic survey, participants were asked if they could guess the hypotheses of the study.

Procedure

The study was approved by the Xavier University of Louisiana (XULA) Institutional Review Board (project identification code 578). Participants were recruited from summer enrichment programs at XULA. Participants’ parents signed informed consent documents. Students were first given the pre-test (i.e., the AFPD interest and self-efficacy scales). Next, participants watched the video. After the video, they completed the posttest interest and demographic questionnaires. Participants were then shown O*NET, an online career database, where they learned information regarding the careers related to their interests. Participants were then debriefed at the conclusion of the study.

Results

Little’s (1998) omnibus statistical test of missing completely at random (MCAR) was conducted through SPSS’ Missing Value Analysis, and results indicated the data was MCAR, \( \chi^2 (120) = 387.94, p > .05. \) Missing data from the variables ranged from 2\% (one missing case on variable) to 4\% (two missing cases on variable). Data was screened for univariate \( (z \text{ scores } < 3.29) \) multivariate outliers via Mahalanobis distance calculations (Tabachnick & Fidell, 2013); however, none were identified. Total scores were created for the pre- and post-test self-efficacy and interest scores by summing the participants’ answers for each scale and dividing by the total number of items per scale. A preliminary analysis indicated that all pre- and post-test scores on the self-efficacy and interest scales were positively correlated with one another (Table 1).

Table 1

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Note. \( * p < .01 \)

A repeated measures ANOVA via SPSS’ General Linear model was conducted to examine the extent to which investigative interests changed after the participants viewed the vicarious learning video while accounting for preexisting levels of investigative self-efficacy. We separated the participants into two groups based on whether they scored higher or lower than the mean on the pretest self-efficacy measure (\( M = 3.03, SD = .93. \) The high investigative self-efficacy group had an average pretest investigative self-efficacy score of 3.80 (\( SD = .67)\), while the low self-efficacy group had an average pretest investigative self-efficacy score of 2.34 (\( SD = .67)\). Using the high and low self-efficacy groups as a between group factor, the repeated measures ANOVA tested for a main effect of the video intervention as well as an interaction between the self-efficacy group membership and video intervention. The video’s main effect was not significant, Wilks’ Lambda = .989, \( F(1, 45) = .989 \) \( p > .05 \). However, a significant interaction existed between the video
intervention and self-efficacy group membership, Wilks’ Lambda = .868, $F(1, 45) = 6.85$, $p < .05$. After watching the video, the high investigative self-efficacy group’s interest scores increased significantly, changing from an average of 3.51 ($SD = .50$) to 3.61 ($SD = .62$); however, the low investigative self-efficacy group’s interest scores decreased significantly, changing from an average of 2.58 ($SD = .68$) to 2.40 ($SD = .72$).

Discussion

The aim of the present study was to determine how a realistic portrayal of a vicarious learning experience impacted African American girls’ investigative interests based on preexisting levels of investigative self-efficacy. We hypothesized that the video-based vicarious learning experience would improve investigative interest for both low and high investigative self-efficacy groups with larger increases in investigative interests for the low self-efficacy group. Our hypotheses were partially supported. Analyses revealed that vicarious learning alone did not affect investigative self-efficacy; however, the vicarious learning experience combined with preexisting levels of self-efficacy interacted to affect investigative interests. When individuals with lower levels of investigative self-efficacy were exposed to vicarious learning models, their investigative interest suffered. In contrast, when individuals possessed higher levels of investigative self-efficacy prior to receiving a vicarious learning experience, their investigative interests increased as a function of that learning experience.

Similar to past research (e.g., Garriott et al., 2014), we found that vicarious learning experiences have an indirect impact on investigative interests. In the current study, vicarious learning tended to affect interests based on preexisting levels of self-efficacy beliefs. Upward comparisons may account for this finding. When African American girls with low investigative self-efficacy compared themselves to models who demonstrated success in investigative activities, negative cognitions arose, such that their investigative interests decreased (Chan & Lam, 2008). Extrapolating these findings to college, African American women who have lower levels of investigative self-efficacy may compare themselves to models with higher levels of investigative expertise, which may negatively affect their interests, ultimately leading them to discontinue their STEM+M studies. On the other hand, viewing and comparing themselves to models who are relevant to them could increase their investigative interests.

Implications for Career Counseling

Career counselors should use these findings to inform their career workshops. Career counselors who engage in workshops should account for clients’ preexisting levels of investigative self-efficacy before providing them learning experiences as a means to affect their investigative interests. Providing a learning experience without accounting for self-efficacy may actually negatively affect interests for some students, an effect that is counter to their intended objectives.

Career counselors also need to account for ethnic-racial identity and gender when conducting their career workshops. As our study shows, those who have lower levels of preexisting self-efficacy may not benefit from a workshop that does not involve relevant models. By analyzing initial levels of self-efficacy, one may be able to better help students and clients by providing them with the information they need to raise their self-efficacy.

Limitations and Future Directions

While this study possessed many strengths, it also had a few limitations. Many RIASEC scales have been developed in samples
dominated by European Americans, thus their utility in other ethnic-racial groups is questionable (Betz & Gwilliam, 2002). Also, career decisions are usually solidified during college, so career development research on adolescents, especially adolescents of color, is limited. Furthermore, the majority of career decision making scales have been developed on college students (Betz & Luzzo, 1996) rather than middle and high school students. To remedy this issue, career decision making scales should be developed specifically with ethnically diverse adolescents so that more sound research can be conducted on their career decision making processes.

The vicarious learning video did not show any doctors or physicians who were African American women. We hoped that the video would reflect what the participants in the study actually observe on a daily basis in the STEM+M fields. The video served as a real life exemplar of vicarious learning rather than an ideal vicarious learning experience, and this issue may explain why those who initially had low self-efficacy experienced a decrease in investigative interests after watching the video. A video showing African American women scientists would more than likely increase the investigative interests of the African American girls, regardless of their initial levels of self-efficacy, since we know that relevant models are more effective than models who are not like the observer (Bandura, 1977). We hope that future researchers test this idea.

Additionally, multicollinearity, a high degree of shared variability between measures, for pretest and posttest interest scales and pretest and posttest self-efficacy scales was a problem because the correlations exceeded .90. Since the pretest and posttest investigative interests and self-efficacy scales were given within such a short time frame, the high associations that we might expect from a pretest-posttest design were exacerbated. Future researchers could consider a time delayed posttest measurement after the implementation of the learning experience to reduce this multicollinearity effect.

Another limitation of the current study is that we only focused on vicarious learning experiences. Future researchers may wish to replicate this experimental design with other learning experiences. Since performance accomplishments are more likely to have an effect on self-efficacy than the other learning experiences, future researchers should manipulate investigative success experiences to determine the effect on investigative self-efficacy and interests.

Finally, while we measured preexisting levels of investigative self-efficacy, we did not account for how self-efficacy developed. Future researchers should examine other contextual affordances that may play a role in investigative self-efficacy development. African American girls who were previously exposed to relevant investigative models before the workshop may have also been the ones who were more likely to have higher initial levels of perceived investigative mastery. Future researchers could administer the Learning Experiences Questionnaire (LEQ; Schaub, 2004) to assess the relevance and number of investigative learning experiences prior to learning experience manipulation.

**Conclusion**

To our best knowledge, this study is the first to utilize an experimental in-person career workshop to explain African American girls’ career behavior. Vicarious learning’s effect on investigative interests was affected by preexisting levels of investigative self-efficacy. This study may serve as the beginning to using experimental workshops bridging SCCT and Holland frameworks to explain African American girls’ career behavior.
American adolescent girls’ career decision-making.

References


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