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Growth in Career Academy Students' Experience, Knowledge, and Self-Confidence Related to Health Care Careers

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Abstract

A survey measure was developed to assess high school students' experience, knowledge, and self-confidence related to health care careers. In the fall and spring of one school year, the measure was administered to a diverse sample of 2,309 students participating in career academies focused on the health care industry. Confirmatory factor analyses (CFA) supported the reliability and validity of the measure. Using latent difference score modeling, the findings showed that the students exhibited moderate gains in experience (ES = 0.38) and knowledge (ES = 0.37) across the school year, suggesting that the career academies positively impacted their health care career readiness. The students exhibited very little growth in their self-confidence related to health care careers during the same period (ES = 0.05).

Keywords: career academies, career readiness, health care, latent difference score modeling

Introduction

Educational disparities across income levels and racial/ethnic groups are large and impede college and career pathways for many students. One way to address these disparities and promote pathways to college is through career academies. Career academies that offer small and personalized environments in conjunction with specialized academic and career curricula have been widely implemented to improve high school students' academic achievement and prepare them for future careers (Kuo, 2010). Educators have designed many career academies focused on the health care industry because of high demand for health care workers (Henderson, 2013) and students' interests in careers allowing them to help others (Zayas & McGuigan, 2006).

Career academies that participated in the current study aimed to increase students' readiness for careers in the health care industry, prepare them to enroll in post-secondary health care programs, and eventually obtain a job in health care. This study describes the development of a scale to measure high school students' experience, knowledge, and self-confidence related to health care careers, which are important indicators of their career readiness. To assess the impact of the career academies on these three dimensions, we measured participating students' growth across one academic year.

Prior Research on Career Academies

Career academies generally begin in the 9th or 10th grades and continue to serve cohorts of students through the end of high school. They are typically organized as small learning communities that provide students with supportive and personalized learning environments. As part of small learning communities, clusters of students enroll in multiple classes together and receive instruction from a group of academic and career technical education (CTE) teachers that work jointly to plan the career academies' curricula. In addition, career academies combine academic and CTE curricula around career themes (e.g., the health care industry) and provide students with work-based learning experiences through partnerships with employers in their communities (Kemple & Willner, 2008; Stern, Dayton, & Raby, 2010).

Researchers have examined the impact of career academies for over 30 years (Stern et al., 2010) and generally found that career academies have a positive impact on student outcomes. Initial work by Reller (1984, as cited in Stern et al., 2010) showed that students in grades 10-12 had better grades, higher attendance, and earned more credits than comparison students. In addition, Maxwell (2001) tracked academy students after high school and found that they were less likely to need remediation in college English and had higher college graduation rates than non-academy students. Furthermore, Bradby, Malloy, Hanna, and Dayton's (2007) descriptive results showed that, in comparison to all students in California, students in career academies passed a standardized test required for high school graduation at a higher rate.

The most conclusive evidence regarding the impact of career academies comes from a random assignment study conducted by the non-profit research organization, MDRC (Kemple & Scott-Clayton, 2004; Kemple & Snipes, 2000). The study produced a nuanced pattern of findings. Specifically, for students at high risk of dropping out of school, MDRC's research showed that career academies reduced dropout rates, improved attendance rates, and increased the number of credits earned for high school graduation. The career academies also increased students' participation in work-based learning experiences. However, the academies did not have a significant impact on students' achievement on standardized tests (Kemple & Snipes, 2000). Following up with career academy students after high school revealed that academies had a positive impact on the earnings of males but not females. Additionally, the career academies did not have an effect on post-secondary educational attainment (Kemple & Scott-Clayton, 2004).

Health Science Capacity Building Model

The high schools that participated in the current study received funding from the California Department of Education's (CDE) Health Science Capacity Building (HSCB) grant program to plan and operate career academies focused on the health care industry. The HSCB model is a multi-year sequence of academic and CTE courses that provides students with a structured progression of secondary and post-secondary education. The HSCB career academies are designed to be schools within schools. The academies typically enroll 50 to 500 students who take a sequence of academic and CTE courses (e.g., English, social studies, and medical terminology) as a cohort. The use of technology (e.g., iPads, Kindles, tablets, and laptops) is integrated into the CTE courses and the academic teachers incorporate CTE standards into the core academic curriculum. A major component of the HSCB program is articulation with a post-secondary institution and the academies help students transition into post-secondary education and continue a health-related career pathway with the opportunity to earn a certificate or license.

In addition to academic and CTE courses, HSCB career academies have a number of other key components. As part of academies, students complete work-based learning experiences, such as volunteering or working at hospitals and dental offices. Academy students participate in health care-related field trips to hospitals, university medical centers, and medical examiner offices. Guest speakers come to the schools on a regular basis to talk with students about health care careers. Students also participate in Health Occupations Students of America (HOSA) leadership activities. HOSA is a student leadership organization that aims to promote health care careers and enhance the delivery of quality health care. Finally, students develop education plans and discuss plans with their school counselors.

HSCB career academies organized a team composed of academic and CTE teachers from the high schools, teachers from their feeder middle schools, educators from local colleges or universities, and industry partners. Each academy had a designated coordinator who oversaw the day-to-day activities of the academy and administered the grant. More specifically, the coordinator collaborated with CTE and academic teachers on interdisciplinary curricula, worked with health care industry partners to secure work-based learning opportunities, and ensured that teachers had the necessary resources to help shape students' career interests. As part of the program, the educators worked on curriculum development and alignment within the career academies as well as with the middle schools, post-secondary institutions, and industry partners. Each summer, the educators participated in a three-day professional development workshop to develop new strategies for curriculum integration and design a work plan for their academy with specific performance goals, activities, measures, and outcomes.

The CDE funded 35 high schools through the initiative in the 2012-13 school year, nine of which participated in the current study. The nine schools that participated in the study received a mean of $48,508, which was typically distributed over consecutive years. Participating schools received grants for four to six years prior to the 2012-13 school year and had continuously operated their career academies for at least four years.

Social Cognitive Career Theory

Lent, Brown, and Hackett's (2000) social cognitive career theory (SCCT), which is based on Bandura's (1996) social cognitive theory, is used to help frame our study. SCCT is a model that explains how individuals develop career interests and make choices about their careers. In the model, learning experiences influence individuals' self-efficacy (i.e., beliefs about their ability to succeed) and outcome expectations (i.e., beliefs about the outcomes of certain behaviors). Self-efficacy and outcome expectations, along with a variety of contextual influences (e.g., cultural norms), ultimately lead to career interests, goals, and actions. According to the social cognitive approach, activities that students in a career academy participate in can influence their personal efficacy in the domain of career and technical education and set them on a path toward a course of study in a particular field.

Experience, Knowledge, and Self-Confidence

The HSCB model aims to expand students' readiness for health care careers, including their experience with health care industry, knowledge of the industry, and self-confidence that they can succeed in the industry. Experience and self-confidence correspond directly to the learning experiences and self-efficacy constructs included in the SCCT framework. Knowledge, while not included in the SCCT framework, is a critical outcome of any educational activity. In addition to their connection with the SCCT framework, these three constructs were chosen for the current study because the *California Career Technical Education Model Curriculum Standards* emphasize that equipping high school students with CTE learning experiences and knowledge as well as the ability to self-manage their educations and careers is essential for student success in the 21st century economy (CDE, 2013b). The constructs of experience, knowledge, and self-confidence are the focus of the current investigation and gains on these constructs would suggest career academies are positively impacting students.

Experience. In this context, experience can be defined as students' application of knowledge or skills to real-life scenarios and tasks. Work-based learning and field trips are experiential learning activities that have become integral and meaningful components of career academies. For example, students are able to apply their skills while participating in experiential educational projects associated with CTE and HOSA. Pulakos, Arad, Donovan, and Plamondon (2000) point out that the development of employability skills can only be attained if students are provided with meaningful learning experiences and given frequent opportunities to practice and increase their capabilities. Gaining experience in their field of interest and having the opportunity to apply skills learned in the classroom in a real-world setting may increase students' employability skills as they will have had practice performing job-relevant tasks in an applied environment. Findings from previous research indicate that possessing employability skills, such as problem solving, critical thinking, and the ability to collaborate with others, is critical to student success in transitioning to the workforce (Gysbers, 2013; Martin, 2008).

Knowledge. Clark and Estes (2002) describe knowledge as the acquisition of information to enhance the skill sets needed to successfully achieve performance goals and handle new and unexpected school, job, and life challenges. Anderson and Krathwohl (2001) make the distinction between three types of knowledge that can serve as a framework for organizing CTE and the HSCB model. First, factual knowledge refers to the most basic level of knowledge. Through their participation in the HSCB academies, students acquire general knowledge about health care careers including skills needed in the health care industry and medical terminology. An example of this type of knowledge is knowing that a mental health disorder (e.g., depression) can coexist with a physical health disorder (e.g., diabetes). Second, procedural knowledge refers to knowing *how* to do something that requires a specific type of skill or process when performing a task. At this level, students are beyond simply knowing a collection of facts; students are able to apply knowledge and practice until they become skilled at employing a procedure. For example, students are able to describe how to take vital signs and then have the ability to apply that knowledge using a full-body mannequin simulator. Finally, metacognitive knowledge refers to self-knowledge or the type of knowledge that allows one to self-monitor and self-evaluate while working toward a specific task (Peña, Kayashima, Mizoguchi, & Dominguez, 2011). While students are making meaningful applications in real-life settings, they must use strategic thinking and reasoning to improve their critical thinking skills. Strategic knowledge allows students to think through their application of key health care and career readiness concepts.

Self-Confidence. The perception of one's ability or self-confidence is a critical motivator of human behavior and important for self-regulation (Bandura, 1986). Students who are able to sustain their self-confidence in a CTE program are more likely to be successful in self-managing their efficacious beliefs and obtaining their school and career goals (Bottoms, Egelson, Sass, & Uhn, 2013). Achievement motivation theorists (e.g., Eccles & Wigfield, 2002) contend that individuals' career choice, career persistence, and school performance can be explained in part by their beliefs about how well they will do on a specific activity and the extent to which they value the activity. Given these findings, CTE programs should seek to instill self-confidence in the participating students. The value that students place on their learning experiences has been shown to be associated with career exploration (Creed, Patton, & Prideaux, 2007) and career persistence (Lent, Brown, & Larkin, 1986). That is, the more confident students are, the more they will value learning, be invested in what they are learning, and persist at achieving a set of learning tasks and performing on the job (Clark & Estes, 2002).

Goals of the Current Study

Using a sample of high school students enrolled in nine career academies focused on the health care industry, this study had two goals. First, we examined the psychometric properties of a survey measure we developed to assess students' experience, knowledge, and self-confidence related to health care careers using confirmatory factor analysis (CFA). Second, we assessed growth in students' experience, knowledge, and self-confidence related to health care careers between the fall and spring of one academic year using latent difference score modeling.

Method

Participants

Study participants included 2,309 students from nine career academies located in public high schools in Southern California. Given resource limitations, we opted to survey students in nine HSCB schools that were within driving distance of the lead researcher's office in Southern California. The mean number of participating students per academy was 256.6, ranging from 33 to 441 students. The Academic Performance Index (API) is an overall measure of a school's performance on California's standardized tests and can range from 200 to 1,000. Among schools in the sample, the mean API score was 805.7 in 2012-13 and ranged from 718 to 961. Five of nine schools had API scores that were above the statewide mean of 757 for grades 9-11. Extant data from the state indicated the proportion of students that qualified for free/reduced price lunch ranged from 3 to 85 across the schools, with a mean of 50.4 (CDE, 2013a).

Participating students were distributed across the 9th (30.0%), 10th (25.4%), 11th (24.6%), and 12th (19.2%) grades. Less than 1.0% of students reported other grade levels or had missing data for the grade level item. The majority of the sample was female (65.7%); 34.2% were male; less than one percent did not report their gender. The racial/ethnic breakdown of the students was 4.5% African American/Black, 0.4% American Indian/Alaskan Native, 10.4% Asian, 10.4% Filipino, 46.6% Latino/Hispanic, 0.7% Pacific Islander, 14.2% White, 1.2% Other/Declined to State, and 11.6% Multiple Races/Ethnicities.

Measures

The current study utilized data from a subset of items taken from a larger survey that was administered as part of an evaluation of the HSCB career academies during 2012-13. The larger survey included questions that addressed a range of topics related to the academies' programs, including the students' work-based learning activities, field trips, CTE courses, and technology use. The survey began with demographic questions.

We developed the 23 items used in the current study to measure three key dimensions and aspects of health science career technical education standards: (1) experience, (2) knowledge, and (3) self-confidence. These 23 items were designed based on career readiness behaviors and industry competencies that address the *California Career Technical Education Model Curriculum Standards* (CDE, 2005, 2013). The experience subscale contained seven items that the students rated using a 1 (*no experience*) to 4 (*a lot of experience*) scale. The students rated the nine items in the knowledge subscale using a 1 (*no knowledge*) to 4 (*a lot of knowledge*) scale. In addition, the self-confidence subscale included eight items that the students rated using a 1 (*no confidence*) to 4 (*a lot of confidence*) scale. When possible, parallel items across the three subscales were utilized. In the fall and the spring, all of the subscales had high levels of internal consistency reliability (all αs > .90).

Procedure

The students completed the fall survey during a five-week period in September and October of 2012 and the spring survey during a five-week period in April through June of 2013. On the survey administration days, the career academy teachers brought groups of students to the schools' computer labs. In the fall, students were provided assent forms describing the research project and indicating that their participation was voluntary. As a condition of enrollment in the academies, parents of the participating students provided consent for their students to participate in research activities. The assent form contained a URL for the online version of the survey and a unique survey access code. In the spring, returning students were given their assent form from the fall so that they could use the same access code and their data could be linked across time.

Difficulties during the survey administration at two of the schools negatively impacted the number of completed surveys. In the fall, the online survey system was not functioning on the day of one school visit. We left the assent forms with the students in this school and the academy teachers assigned the survey as homework. However, only 33 of the 60 students present on the day we visited the school completed the survey. In addition, one of the schools had over 600 students participating in the academy; however, only 203 students were able to take the survey in the fall because of the limited capacity of this school's computer lab. In the spring, students at this school completed a paper version of the survey at the school's request.

Career academies reported the number of students in their programs in the fall. Based on these numbers, the overall response rate was 78.5% (i.e., 2,309 completed surveys / 2,943 students). However, two schools that had difficulties with the survey administration in the fall lowered the response rate considerably. Response rates for seven schools that did not have difficulties with survey administration were all above 88.1% in the fall.

Missing Data

The study's missing data resulted from students not completing individual items in the fall and spring and not being present on the survey administration days in the spring because they left the academy or were absent. Across the items, the amount of missing data ranged from 0.4% to 1.5% in the fall and from 14.4% to 15.2% in the spring. The attrition rate from the fall to the spring was 14.3%. Our use of maximum likelihood estimation allowed all students to be included in the models even if they did not have complete data (Schafer & Graham, 2002).

Analysis

The current study utilized CFA and latent difference score modeling using *Mplus* version 6.1 (Muthén & Muthén, 1998-2010). Model fit was evaluated using the chi-square statistic, Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), and Akaike Information Criterion (AIC). To compare nested models, we used the chi-square difference test.

CFA is an analytic technique that determines whether sample data is consistent with the factor structure of the hypothesized model. The current model included latent factors representing experience, knowledge, and self-confidence in the fall and spring. In other words, the CFA allowed us to test whether our a priori hypothesis about the experience, knowledge, and self-confidence items comprising separate constructs was supported by the data we collected. In addition to providing estimates for the factor loadings and correlations among the latent factors, CFA allows for the estimation of latent factor means (i.e., the means of the constructs comprised by the individual items; Loehlin, 2004).

Latent difference score modeling (McArdle, 2001) is a reformulation of the basic CFA model that identifies the amount of change on the latent factor means that occurred between the fall and spring. The change scores in a latent difference score model are measured without error because the latent variables are measured with multiple indicators (Little, Bovaird, & Slegers, 2006). In the current study's latent difference score model, we specified regression paths fixed to 1.0 between the corresponding fall and spring latent factors (e.g., fall to spring experience). Three latent variables representing the difference scores for the experience, knowledge, and self-confidence factors were added to the CFA model. We also specified covariances between the fall latent factors and the corresponding latent difference scores, as well as regression paths fixed to 1.0 between the latent difference scores and the corresponding spring latent factors.

To better characterize the magnitude of the growth shown by the students on the experience, knowledge, and self-confidence latent factors, we used the latent difference scores to calculate effect sizes. First, the pooled standard deviations for each subscale were calculated using the standard deviations for the fall and spring latent factors (Hill, Bloom, Black, & Lipsey, 2008). Next, the experience, knowledge, and self-confidence latent difference scores were divided by the respective pooled standard deviations to calculate the effect sizes.

Results

Descriptive Statistics

Tables 1, 2, and 3 include the means and standard deviations in the fall and spring for the experience, knowledge, and self-confidence items, respectively. The fall means for the experience items ranged from 2.23 to 2.66. The spring means for the experience items were higher than the fall means and many of the spring means approached 3 (*some experience*) on the four-point scale. The means for the knowledge items ranged from 2.49 to 3.03 in the fall. By the spring, the means for all of the knowledge items increased and the means for six of the nine items were above 3 (*some knowledge*). The fall means for the self-confidence items ranged from 2.95 to 3.35. The means for all of the self-confidence items increased in the spring and were above 3 (*some confidence*).

Table 1

Item Means and Standard Deviations in Fall and Spring for the Experience Subscale (n = 2,292)

	Fall			Spring		
Item	*M*	*SD*	*n*	*M*	*SD*	*n*
How much experience do you have						
(1) …using the skills needed for health care careers?	2.40	0.91	2,292	2.76	0.86	1,977
(2) …communicating and listening effectively to solve problems in the health care industry?	2.51	0.95	2,291	2.87	0.88	1,972
(3) …learning about the roles and responsibilities of people who work in the health care industry?	2.66	0.92	2,276	2.94	0.86	1,962
(4) …working with diverse cultures and communities?	2.43	1.04	2,279	2.84	0.97	1,958
(5) …using the medical terminology that workers in the health care industry use?	2.39	0.96	2,277	2.77	0.91	1,962
(6) …developing a personal program of study/ education plan that will lead to a health care career?	2.23	0.96	2,283	2.59	0.95	1,966
(7) …seeking out school counselors and other resources to help you carry out your personal program of study/education plan?	2.25	1.00	2,282	2.54	0.99	1,966

Note. The items were rated on a 1 (*no experience*) to 4 (*a lot of experience*) scale.

Table 2

Item Means and Standard Deviations in Fall and Spring on the Knowledge Subscale (n = 2,300)

	Fall			Spring		
Item	*M*	*SD*	*n*	*M*	*SD*	*n*
How much knowledge do you have about						
(1) …using the skills needed for health care careers?	2.87	0.75	2,300	3.14	0.69	1,975
(2) …the education requirements needed for health care careers?	3.00	0.79	2,298	3.23	0.72	1,971
(3) …applying and interviewing for jobs in the health care industry?	2.50	0.95	2,283	2.89	0.89	1,964
(4) …communicating and listening effectively to solve problems in the health care industry?	2.81	0.88	2,295	3.11	0.82	1,975
(5) …the roles and responsibilities of people who work in the health care industry?	3.03	0.83	2,288	3.22	0.76	1,964
(6) …working with diverse cultures and communities?	2.74	0.98	2,285	3.07	0.88	1,971
(7) …the medical terminology that workers in the health care industry use?	2.73	0.92	2,275	3.05	0.82	1,961
(8) …developing a personal program of study/ education plan that will lead to a health care career?	2.49	0.96	2,287	2.81	0.91	1,969
(9) …what school counselors and other resources can do to help you carry out your personal program of study/education plan?	2.51	0.98	2,282	2.78	0.94	1,958

Note. The items were rated on a 1 (*no knowledge*) to 4 (*a lot of knowledge*) scale.

Table 3

Item Means and Standard Deviations in the Fall and Spring on the Self-Confidence Subscale (n = 2,293)

	Fall			Spring		
Item	*M*	*SD*	*n*	*M*	*SD*	*n*
How much confidence do you have that you						
(1) …can use the skills needed for health care careers?	3.12	0.84	2,293	3.17	0.79	1,968
(2) …will complete the education requirements needed for health care careers?	3.35	0.80	2,291	3.37	0.77	1,967
(3) …can successfully apply and interview for jobs in the health care industry within the next five years?	3.09	0.90	2,293	3.18	0.83	1,966
(4) …can communicate and listen effectively to solve problems in the health care industry?	3.14	0.85	2,277	3.26	0.79	1,968
(5) …can handle the roles and responsibilities of people who work in the health care industry?	3.19	0.86	2,286	3.29	0.79	1,965
(6) …can work with diverse cultures and communities?	3.21	0.90	2,277	3.33	0.80	1,961
(7) …can use the medical terminology that workers in the health care industry use?	3.07	0.88	2,275	3.14	0.83	1,958
(8) …can seek out school counselors and other resources to help you carry out your personal program of study/education plan?	2.95	0.94	2,277	3.02	0.90	1,957

Note. The items were rated on a 1 (*no confidence*) to 4 (*a lot of confidence*) scale.

Confirmatory Factor Analysis

First, a six factor CFA with latent factors for experience, knowledge, and self-confidence in the fall and spring was specified (see Figure 1 and Model 1 in Table 4). Each item loaded on only one factor and the model also included all possible covariances among the latent factors, which allowed the latent factors to correlate with one another. This baseline model did not provide a good fit to the data and was used as a point of comparison for alternative models.

The second model (i.e., Model 2 in Table 4) added correlated error terms within each time point between the manifest variables representing the experience, knowledge, and self-confidence items assessing the same topic. For example, we allowed the error terms for the fall experience, knowledge, and self-confidence items that asked about the "skills needed for health care careers" to be correlated. The correlation among these error terms suggests that the experience, knowledge, and self-confidence items have something in common that is not taken into account by the correlations between their respective latent factors, such as similarities in self-reporting (Saris & Aalberts, 2003). In total, 42 covariances were added to the model by including the correlated error terms in the fall and the spring. The addition of these correlated error terms significantly improved the fit of the model in comparison to Model 1 (χ^2_{diff} = 6,419.28, $p < .001$) and the model provided a good fit to the data (CFI = .95, RMSEA = .04).

The third model (i.e., Model 3 in Table 4) added correlated error terms across time between the parallel items in the fall and spring. For instance, we allowed the error term between the experience items in the fall and spring asking about "communicating and listening effectively" to correlate. Twenty-four covariances were added to the model (i.e., one for each item) by correlating the error terms across time. Including these correlated error terms significantly improved the fit of Model 3 in comparison to Model 2 (χ^2_{diff} = 425.26, p < .001). Consistent with Model 2, Model 3 provided a good fit to the data (CFI = .96, RMSEA = .04).

In the final CFA model (i.e., Model 4 in Table 4), measurement invariance was tested by constraining the factor loadings to be invariant across the two time points. For example, we constrained the factor loading for the first experience item in the fall to be equivalent to the factor loading for the same item in the spring. This is an important step because constraining the factor loadings dictates that the fall and spring factors measure the same construct in the same way (Horn & McArdle, 1992). The overall model fit for Model 4 (CFI = .96, RMSEA = .04) was good and was consistent with Model 3. The addition of these 21 constraints (one factor loading on each of the six factors was already constrained to 1.0 to identify the model) did have a small but statistically significant negative impact on the model fit model (χ^2_{diff} = 33.92, p < .05). In contrast, the AIC statistic for Model 4 (AIC = 194,576) was lower than the AIC statistic for Model 3 (AIC = 194,584), which suggests Model 4 was a slightly better fit to the data. Given that the decrement in model fit based on the chi-square difference test was small and the AIC was lower, the constraints from Model 4 were retained in the final model.

The standardized factor loadings from the final CFA model are shown in Table 5. In the fall, the mean factor loading was .75 and ranged from .67 to .83. Of the 24 factor loadings, 20 were above .70. Similarly, the mean factor loading was .76 in the spring and ranged from .67 to .86. Twenty-one of the 24 factor loadings were above .70 in the spring. Factor loadings in this range are considered excellent and indicate that the items are pure measures of the factors of interest (Tabachnick & Fidell, 2001).

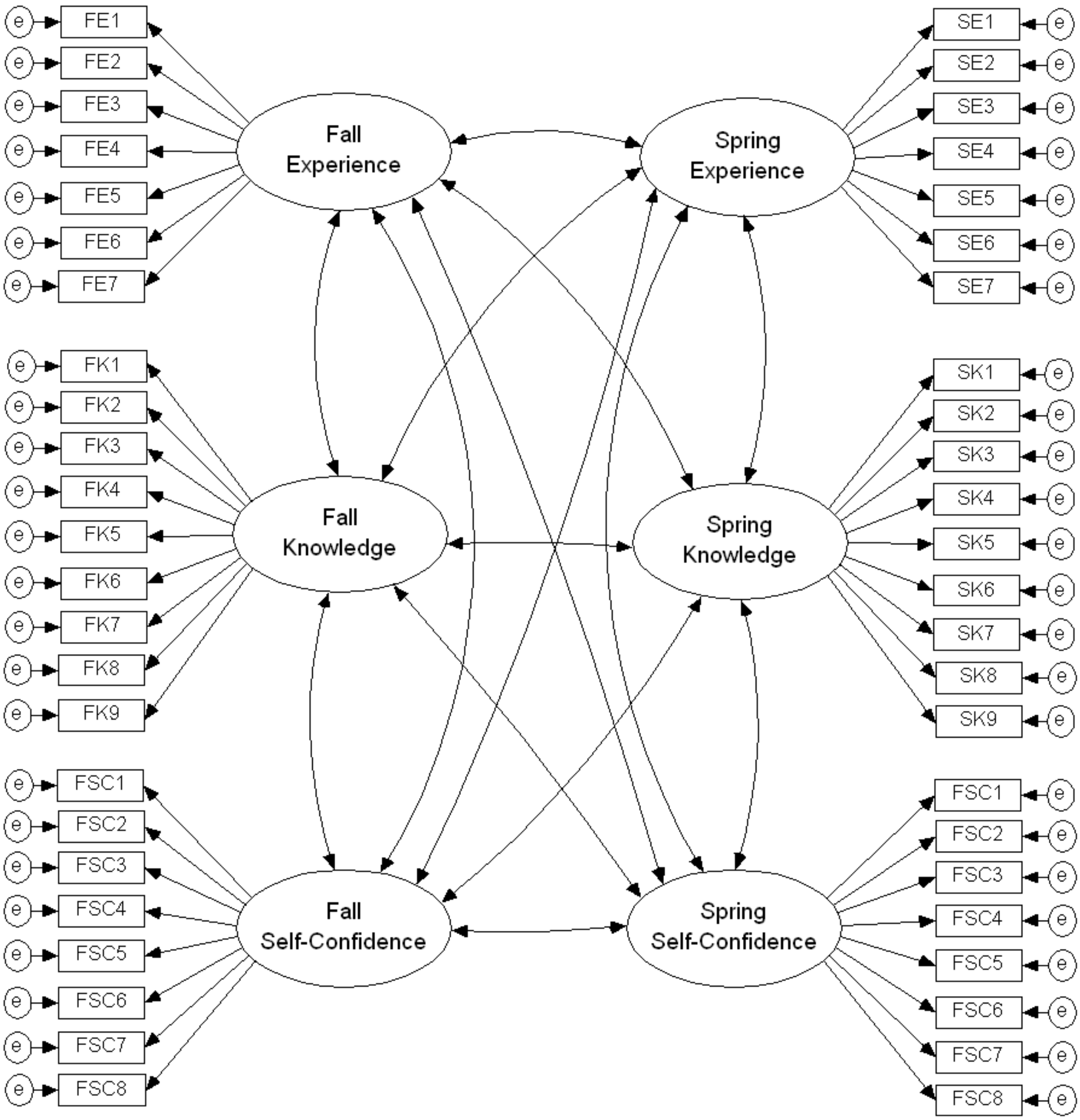

Figure 1. Model for the confirmatory factor analysis.

Table 4

Measures of Model Fit for the Confirmatory Factor Analyses (n = 2,309)

Model	Description	χ^2 (*df*)	χ^2_{diff} (*df*)	CFI	RMSEA	AIC
1	Base Model	11,040.50* (1,065)		.86	.06	201,296
2	Correlated Errors within Time	4,621.22* (1,023)	6,419.28* (42)	.95	.04	194,961
3	Correlated Errors within and across Time	4,195.96* (999)	425.26* (24)	.96	.04	194,584
4	Correlated Errors within and across Time and Constrained Factor Loadings	4,229.88* (1,020)	33.92* (21)	.96	.04	194,576

Note. CFI = Comparative Fit Index. RMSEA = Root Mean Square Error of Approximation. AIC = Akaike Information Criterion.
*$p < .05$.

Latent Difference Score Model

The latent difference score model was tested in order to assess the amount of change on the experience, knowledge, and self-confidence factors between the fall and spring. The model included all of the correlated error terms and the constraints on the factors incorporated in the final CFA model. The measures of model fit for the latent difference score model were identical to the final CFA model because the models reproduce the variance-covariance matrix.

The latent difference score model revealed that the fall experience latent factor mean was 2.40 (*SE* = 0.019) and increased by an average of 0.35 (*SE* = 0.022) between the fall and spring, which was statistically significant ($p < .001$). The students' growth from fall to spring on the experience, knowledge, and self-confidence factors is shown in Figure 2. The effect size based on the mean amount of growth shown by the students on the experience latent factor was 0.38. The fall knowledge latent factor mean was 2.87 (*SE* = 0.015) and, on average, increased by 0.27 (*SE* = 0.018) in the spring. The gain based on the knowledge difference score was also statistically significant ($p < .001$) and was equivalent to an effect size of 0.37. The mean for the fall self-confidence latent factor (*M* = 3.12, *SE* = 0.018) was higher than the means for the fall experience and self-confidence factors. However, the mean change from fall to spring for self-confidence was 0.04 (*SE* = 0.020) and was smaller than the growth shown by the students on the experience and knowledge factors. After using the Bonferroni adjusted *p* value (i.e., $p = .017$) to account for the multiple outcome variables, the self-confidence latent difference score was not statistically significant ($p = .03$) and the effect size was only 0.05.

Table 5

Standardized Factor Loadings and Standard Errors from the Confirmatory Factor Analysis with Correlated Errors within and across Time and Constrained Factor Loadings (n = 2,309)

	Fall		Spring	
	Factor Loading	*SE*	Factor Loading	*SE*
Experience				
Item 1	.78	0.009	.79	0.009
Item 2	.80	0.008	.84	0.007
Item 3	.79	0.008	.83	0.008
Item 4	.68	0.010	.70	0.010
Item 5	.76	0.009	.78	0.009
Item 6	.77	0.009	.78	0.009
Item 7	.69	0.010	.69	0.011
Knowledge				
Item 1	.74	0.010	.74	0.010
Item 2	.72	0.010	.74	0.010
Item 3	.74	0.010	.74	0.010
Item 4	.77	0.009	.78	0.009
Item 5	.74	0.009	.77	0.009
Item 6	.67	0.011	.68	0.011
Item 7	.71	0.010	.72	0.010
Item 8	.73	0.010	.74	0.010
Item 9	.67	0.011	.67	0.011
Self-Confidence				
Item 1	.76	0.009	.77	0.009
Item 2	.77	0.009	.77	0.009
Item 3	.78	0.008	.79	0.009
Item 4	.82	0.007	.84	0.007
Item 5	.83	0.007	.86	0.007
Item 6	.71	0.010	.74	0.010
Item 7	.80	0.008	.78	0.009
Item 8	.70	0.010	.70	0.011

Note. All factor loadings were significant at $p < .001$.

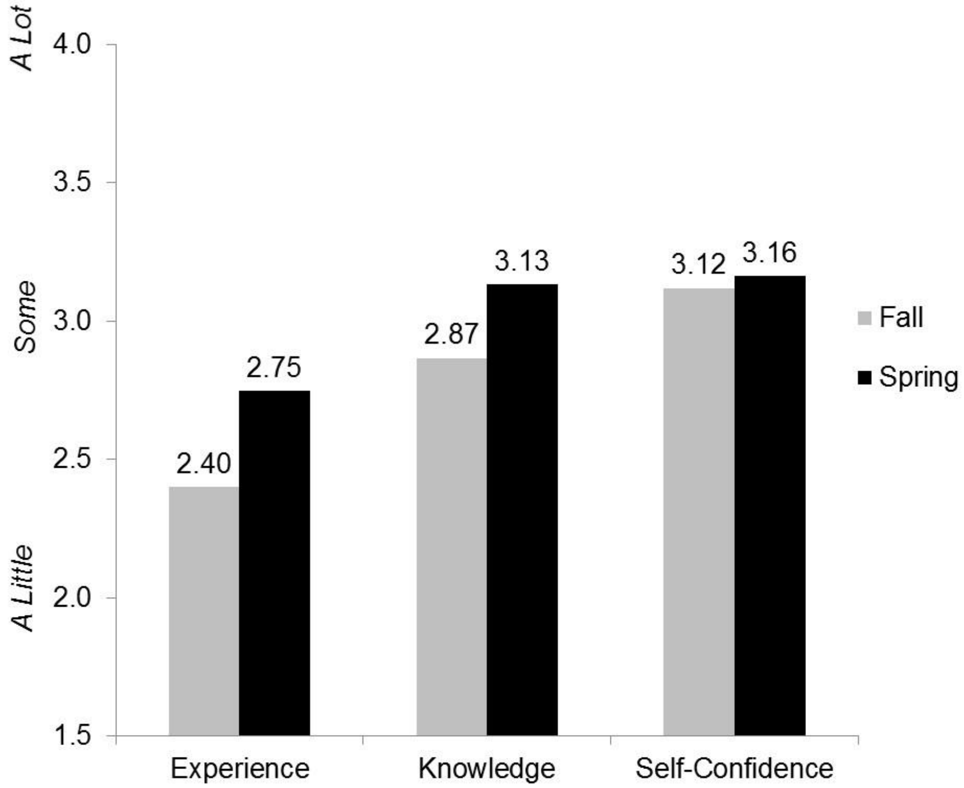

Figure 2. Fall and spring means for the experience, knowledge, and self-confidence factors.

Discussion

As part of the current study, we developed a survey measure to assess high school students' experience, knowledge, and self-confidence related to health care careers. The items in the survey measure asked students about a range of topics related to health care careers, such as using medical terminology and applying and interviewing for jobs in the field. The first aim of the study was to investigate the psychometric properties of the survey measure, which included the assessment of the reliability and validity of the measure.

Our analyses indicated that the experience, knowledge, and self-confidence subscales were reliable (i.e., consistent). With Cronbach's alpha estimates above .90 (John & Benet-Martínez, 2000), the internal-consistency reliability of the subscales was very high. Similarly, the factor loadings from our CFA, which ranged from .67 to .86, were considered very good to excellent and indicated that the items within each subscale were all measuring the same constructs (Tabachnick & Fidell, 2001). Finally, the correlations between the experience, knowledge, and self-confidence subscales in the fall and their corresponding subscales in the spring were moderate in size (i.e., r = .52 to r = .54) and indicated that the measures were fairly consistent across one school year.

The results from the CFA supported the validity of the subscales (i.e., the subscales measured what they were designed to measure). The analysis of the internal structure of a measure, such as the examination of the interrelationships among items, can provide evidence for validity (American Educational Research Association, 2014). Consistent with our goal for the development of the survey measure, the CFA results showed that the experience, knowledge, and self-confidence items in each subscale measured their own separate constructs. The correlations among the factors in the fall and spring provided further evidence for validity. In agreement with prior research (e.g., Rivet & Krajcik, 2004, 2008), there were strong associations between the experience and knowledge factors. Although the correlations between the self-confidence factor and the experience and knowledge factors were smaller than the correlations between the experience and knowledge factors, they were still statistically significant, which aligns with the prior research (e.g., Bandura, 1986, 1997; Usher & Pajares, 2008). The positive correlations between self-confidence and experience and self-confidence and knowledge could result from students who have positive experiences learning about health care careers showing gains in their self-confidence and continuing to seek out more experiences. However, the correlations may be weakened somewhat by other students who do not increase their self-confidence after spending significant amounts of time struggling to learn about health care careers.

We assessed growth in the participating students' experience, knowledge, and self-confidence related to health care careers across one school year using latent difference score modeling. The latent difference score model allowed us to measure changes in the means associated with the experience, knowledge, and self-confidence latent factors from the CFA. The type of quasi-experimental design employed for the current study, which Shadish, Cook, and Campbell (2002) term a one-group pretest-posttest design, provided preliminary evidence regarding the impact of the career academies on the students' health care career readiness.

The academy students' experience and knowledge related to health care career readiness showed statistically significant growth from fall to spring. The HSCB career academies are designed to increase students' health care career readiness to ease their transitions to post-secondary education institutions and the health care workforce. The gains made by the students suggest the academies have been effective at increasing students' experience and knowledge related to health care careers. Additionally, the knowledge and experience gains made by the students could lead to increased commitment to educational and career goals (Symonds, Schwartz, & Ferguson, 2011). The effect sizes indexing the growth for the experience and knowledge measures were 0.38 and 0.37, respectively. Effect sizes in this range would compare favorably with the results from the majority of random assignment studies on educational interventions targeting high school students (Hill et al., 2008).

The academy students' growth in self-confidence related to health care careers from fall to spring was not statistically significant and the effect size indexing this growth was very small. In the fall, the mean for the latent factor for self-confidence was higher than the means for the experience and knowledge latent factors. Consistent with the prior research that found unskilled individuals have inflated assessments of their abilities (Kruger & Dunning, 1999), the students' initial lack of knowledge about the health care industry may have led to the high self-confidence ratings in fall. By the spring, students had learned more about health care careers and were likely able to more accurately evaluate their self-confidence, which resulted in the small gain from fall to spring. Given the SCCT framework's emphasis on self-efficacy expectations (Lent et al., 2000), the HSCB academies may still need to focus on students' self-confidence related to health care careers even though the students' ratings were relatively high in the fall and spring.

Limitations

One set of limitations relate to the self-report measures used in the current study. Much has been written about the validity of self-reported data and it has been argued that the data from self-reported measures may not correspond to "reality" (Barker, Pistrang, & Elliott, 2005). Social desirability biases can cause individuals to respond to surveys in ways that make them look more favorable (Porter, 2011) and the students may have responded more positively to the survey items because of this bias. In addition, rather than asking for self-reports, the students' knowledge of health care careers could be better measured with a content knowledge assessment in future studies. Other limitations result from the study's use of a one-group pretest-posttest quasi-experimental design, which hindered our ability to make strong causal inferences about the impact of the career academies. The two most plausible threats to the internal validity of the study were maturation and history (Shadish et al., 2002). That is, the design did not allow us to rule out the possibility that the students' gains were due to growing one year older or experiences outside of the career academies.

Conclusions

The SCCT framework hypothesizes that individuals' learning experiences influence their self-efficacy expectations (Lent et al., 2000). Although the current study was not a direct test of the framework, the CFA results were consistent with the SCCT model and showed significant associations between the students' experience and self-confidence related to health care careers. Further research would be needed to examine potential causal or reciprocal associations between these two constructs with students in career academies.

The CFA results indicate the experience, knowledge, and confidence subscales were reliable and valid measures. As a result, they could be used in future research to evaluate career academies and potentially to investigate the SCCT framework. Given the simplicity of the subscale, future researchers may be able to add additional items to the subscale that address activities that occur in the career academies they are studying (e.g., working with patients with mental health disorders) without impacting the reliability and validity of the subscales.

The state of California spends approximately $2 million dollars annually to fund the HSCB career academies with the aim of introducing students to health care careers and preparing them for post-secondary education and careers in the industry. The findings from the current study suggest that the HSCB career academies had a positive impact on the participating students' experience and knowledge related to health care careers. Future research could examine whether the impact of the HSCB career academies varies across different demographic subgroups (e.g., racial/ethnic groups). Additionally, given the level of investment that California makes in the career academies, future research that utilizes a control or comparison group of students who did not participate in the academies is warranted so that stronger conclusions can be drawn about the impact of the academies.

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